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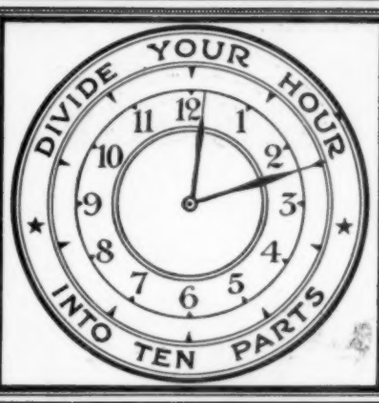
THE PERIODOGRAPH

A DECIMAL TIME-KEEPING MACHINE

By J. V. Hunter, Western Editor

The division of the hour into units of a sixtieth part has prevailed since early history, and while changes have been nationally advocated on different occasions nothing has been accomplished toward simplifying the present system. The creation of this new time-keeping method was intended to simplify the work of the payroll computer and the methods of manufacture employed are in some respects unique.

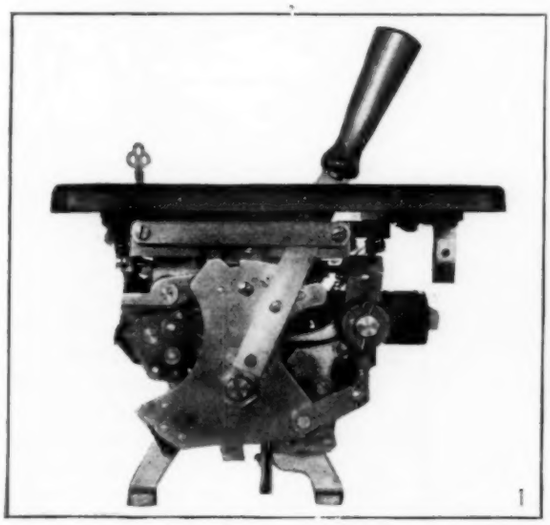


IN ITS origin and development the Periodograph may be looked upon to some extent as a romance of the *American Machinist*. The first idea of this time-keeping system which aided in making it possible was developed in 1905, when H. B. McCabe, then an instructor in the Engineering College of Lewis Institute, Chicago, wrote an article appearing on page 511, Vol. 28, of the *American Machinist*, describing his idea of a new decimal system of time keeping which should prove advantageous to many modern factory systems.

The idea was essentially that instead of keeping time by hours and minutes or quarter-hours, that all time should be kept by periods which were decimals of the hour, and that all piece-work and premium-payment systems should be arranged in accordance. These periods would represent in the majority of cases one-tenth of an hour and be numbered consecutively, and consequently the time of a workman on any operation could be readily figured by subtracting the period when he commenced a job from the corresponding period when he finished the work.

This article by Mr. McCabe was read by officials of the Gisholt Machine Co., Madison, Wis., who were then seeking a new method of cost accounting, and the ensuing correspondence with him finally led to his undertaking to design a time-keeping and registering device which would enable the Gisholt Co. to employ the method of decimal time keeping. The first machines were built and used in the plant of this company, and later, others of the same type were built for manufacturing friends who became interested in installing a similar system. Eventually, the Gisholt Co. took up the manufacture of these time-recording devices as a commercial venture, and has built a modern factory solely devoted to their production, which is distinct from the many other separate departments of the plant.

The Periodograph department is an independent manufacturing unit, and is doubly interesting in its



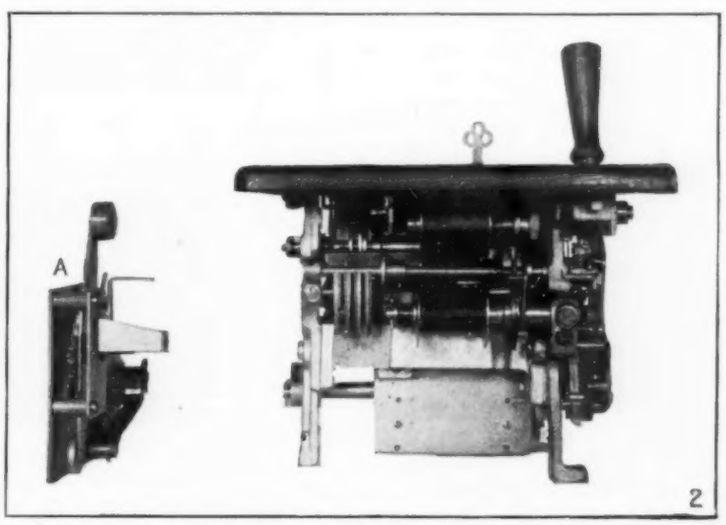


FIG. 1. END VIEW OF PERIODOGRAPH REGISTER. FIG. 2. SIDE VIEW OF REGISTER AND DELAYING DEVICE

completeness of equipment in every line, from its punch presses to its own heat-treating and hardening departments. Some conception of the many parts of the Periodograph register which enable it to perform its functions properly may be gained from the side view, Fig. 1, and the front view, Fig. 2. The separate portion *A*, Fig 2, is the delaying device, which was removed from the main body in order to show more clearly its parts. The purpose of the delaying device is to prevent the control clock, for a certain short period of time, from advancing the time-period number indicated by the machine. This enables the workman who registers a finished-job ticket as completed in one period, to register his next ticket for the start of his new job, and be sure that it will be recorded with the same period number so that there will be no loss of time shown in his records between the finish of one piece of work and the beginning of the next. The register is shown complete in its case in Fig. 3, and the control clock which is employed for governing the movement of all the registers situated throughout the different departments or shops of an entire plant, appears in Fig. 4. This clock, by a cam-actuated switch, sends an electric impulse to all the registers in the plant at the completion of each period, and this changes the registers to record the next consecutive period. The Periodograph shops are well equipped for the class of work which they handle, and as this ranges from delicate work in connection with the fitting up of the control clocks to producing many parts similar to those used on computing machines, the equipment is rather varied. A view of a small portion of the shop, Fig. 5, shows in the foreground the toolmakers' section where all punches and dies and special tools used in the work are designed and built. In the background are two sets of Hardinge bench-lathe units; milling machines and surface-grinding machines fitted with magnetic chucks show less distinctly. A large share of these parts are punchings and some of the presses are handled by female employees, as will be noted from the illustration, Fig. 6. In order to insure safety

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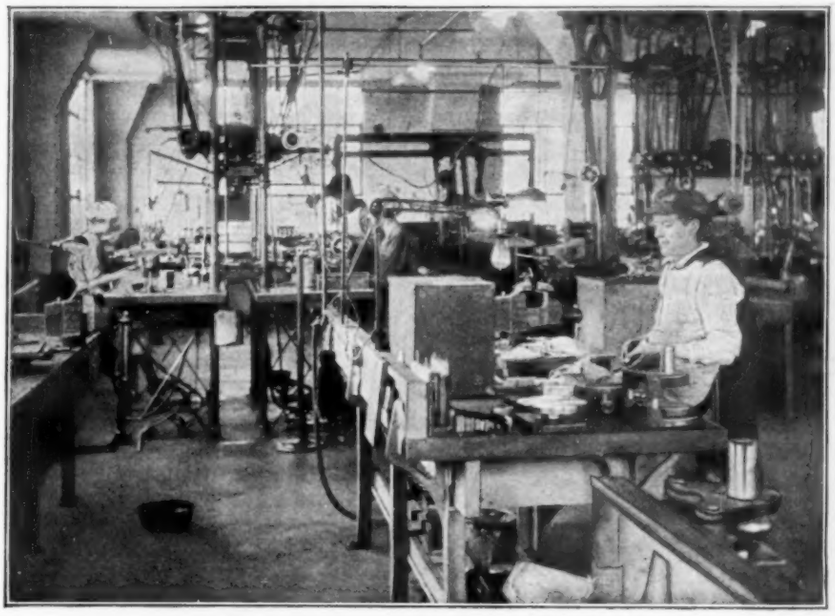
FIGS. 3 AND 4. REGISTER RECORDER IN CASE AND CONTROL CLOCK FOR TIME-RECORDING

to the operator, the dies and punch-press tools are gradually being fitted with safety devices of the type shown in Fig. 7, which prevents the employee from readily getting his hand beneath the punch, and also protects his eyes against the flying particles of scale which so frequently snap off when sheet steel is struck by the punch. The die shown in this illustration is an old one which has been fitted up to make the groove shown at *A* in the sheet of metal lying at the right, and the opening *B* shown in the die is not in service. The sheets of metal being formed are for employees' time-card racks. The punched-steel sides for the card chute are completed in single operations, using the compound dies shown in Figs. 8 and 9. One of the stampings is shown at *A* in Fig. 8, and the stamping for the other side is shown at *B* in Fig. 9. It will be noted that guide pins are provided in the base of all dies which align the base of the punches through suitably bushed bearings; this insures accuracy of die settings, which would otherwise be hard to attain without the use of a sub-press. The type wheel ratchet is blanked out by a compound die, Fig. 10; this leaves 0.006 in. of stock around the edges which is removed in a shearing operation in a second die. This second die, Fig. 11, has a straight-through shearing operation, and employs an ingenious method of ejecting the punchings from the rear face of the die plate. In punching, the blank is laid in the recess plate *A*, which surrounds the punch *B*, and over the center dowel pin *C*. The plate *A* is mounted on springs so that it retreats when the upper die descends upon it, and the punch shears the blank through the opening *D* in the upper die *E*. While the upper die has been descending, the ejector plunger *F* has been passing over the operating pin *G* which is attached to the lower die plate, and on the upward stroke, after the pressure has been released on the die, the ejector plunger reaches a point where it can slip through a groove in the lug *G*. When thus released its operating spring throws it back sharply against the sheared punching, which has been pushed through into a channel on the up-



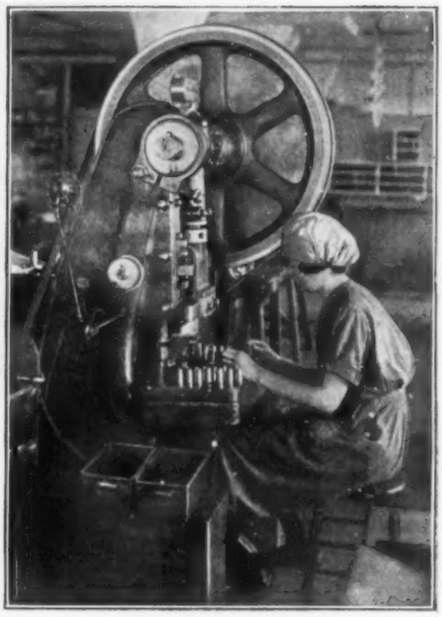


FIG. 5. VIEW OF PORTION OF PERIODOGRAPH SHOP. FIG. 6 WOMAN OPERATING PUNCH PRESS

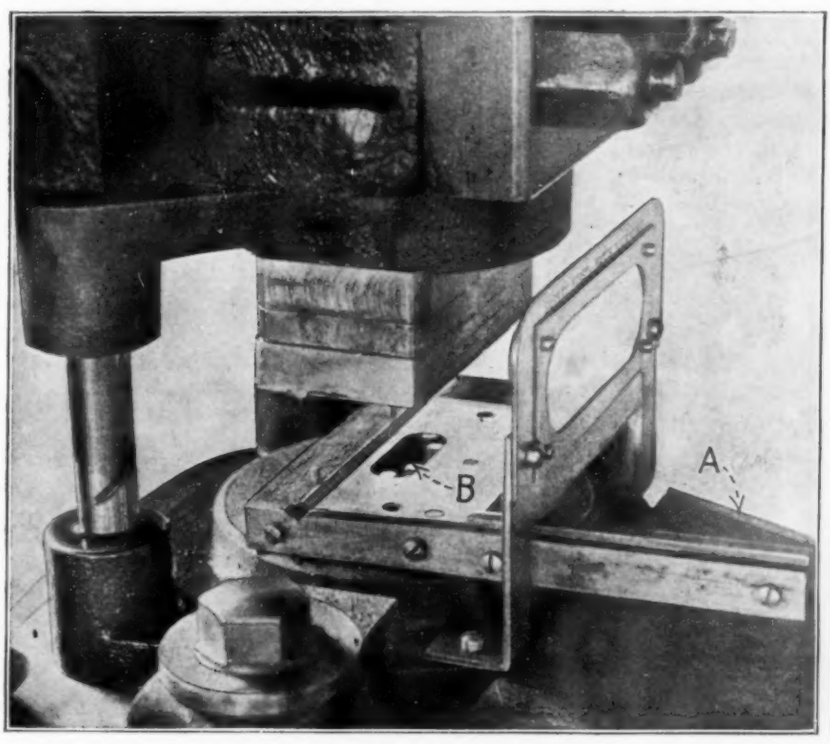
per surface of the die plate. This blow throws this sheared punching out through the opening *H* with sufficient force so that it slides back against the small bell *J*, which has been suspended on a bracket at the rear of the upper die. The sound of the bell each time assures the operator that the punching has been ejected and the punch is clear for the next stroke.

The blanking die for the rocker plate, Fig. 12, and the piercing die for this same plate, Fig. 13, show the method of producing this part. In this combination the main body is made of cast iron with small inserted steel dies at the location of the various holes, the outlines of the steel pieces appearing in the illustration.

The blanking and piercing dies for the control plate are illustrated in Fig. 14. The majority of the punches are rather small and have been reinforced by making them with heavy shanks which project up for some distance above the face of the punch head *A*.

A small trimming die which is used for operations on a number of parts, Fig. 15, has a steel die plate *A*, which contains the outline *B* of the piece to the trimmed. This steel plate is attached by a couple of screws and dowel pins to the base of the main trimming die, and holds the previously punched blank in the proper position for the trimming operation. The large square punch *C*, which is used for this work, was designed to do the trimming for several parts.

A combination fixture, Fig. 16, has been built so that



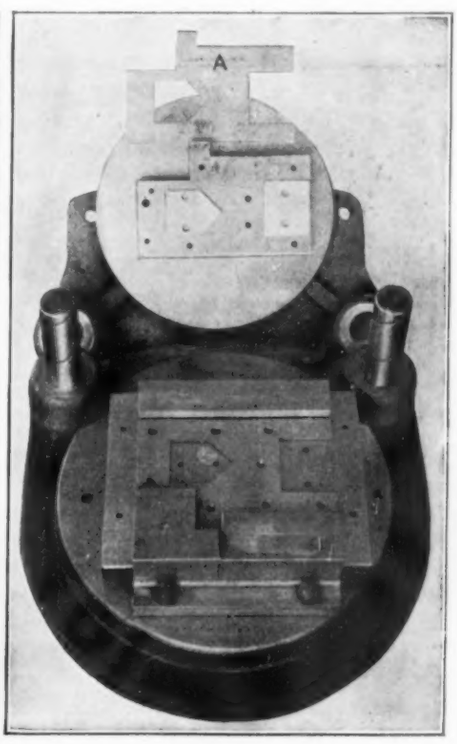
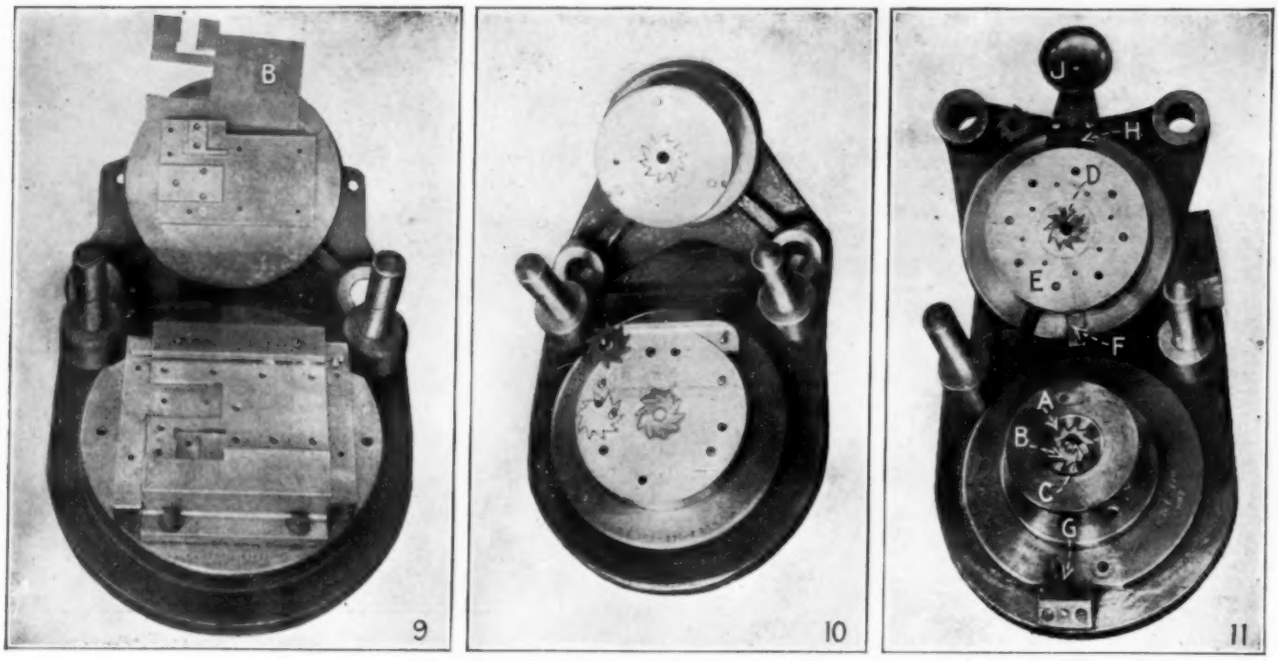


FIG. 7. GLASS-FRONT SAFETY SHIELD FOR BENDING DIE. FIG. 8. PUNCH AND DIE FOR SLIDE OF CARD CHUTE

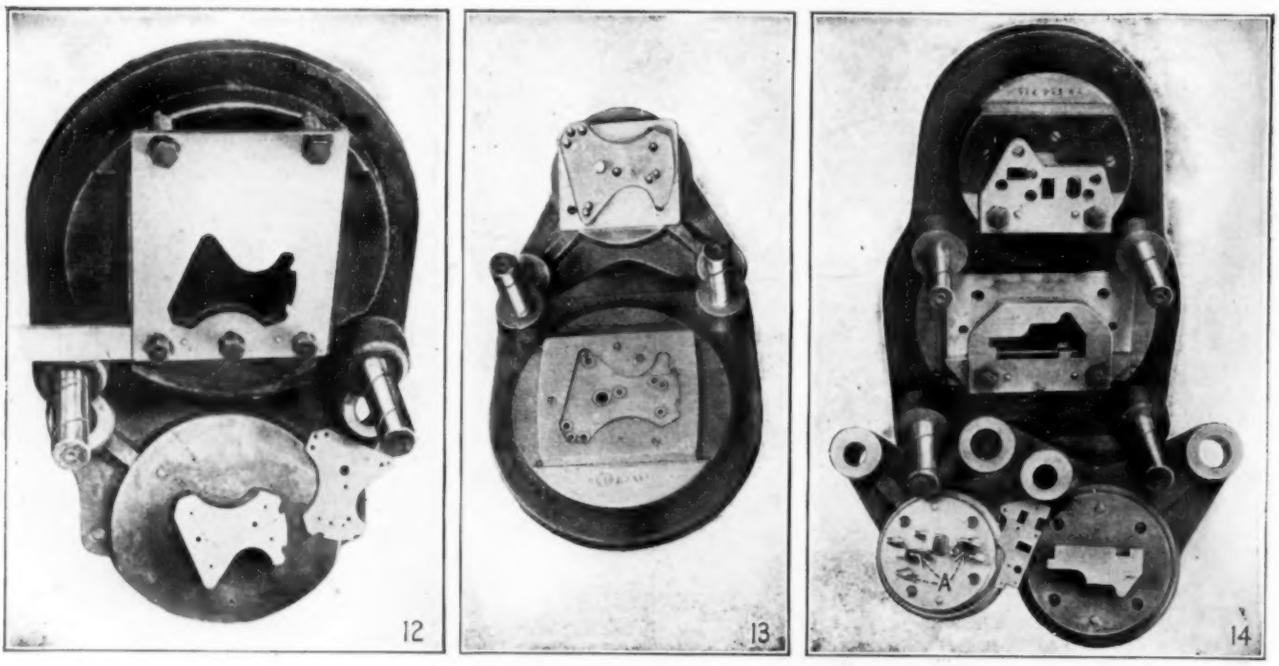


FIGS. 9, 10 AND 11. BLANKING DIES FOR RATCHET WHEELS

Fig. 9—Dies for other side of card chute. Fig. 10—Blanking die for ratchet wheel. Fig. 11—Ratchet-wheel trimming die with ejector

the one die and punch base may be used for holding a number of small punches and dies, thus saving the cost of construction of this heavy part for small punches and dies which will not be used to any great extent. The die base *A*, which holds the interchangeable dies, has dowel pins which insure correct alignment, and similar features are provided on the punch head *B*. A number of the punches and dies which are used in connection with these interchangeable bases are shown surrounding the parts.

Many small parts, such as those shown at *A* in Fig. 17, are made up for special purposes, and in such small quantities that it would not pay to make up special dies for the purpose of piercing these holes so these are being handled by the universal punch and die set shown. The holes in the die *B* are graduated in sizes from the smallest which is No. 58 up to the largest which is $\frac{7}{32}$ in. The type of punch is shown at *C* and also the holder used with them at *D*. These punches are graduated and designed to be the proper size for the sizes of taps usually used in this character of work. A smaller stripper finger *E* is provided which can be bolted into the various holes in the top plate *F*, which also contains two slotted holes for the holding-down bolts *G*, which allow it to be shifted in and out as desired. In order to align the parts to be punched in



FIGS. 12, 13 AND 14. BLANKING AND PIERCING DIES FOR ROCKER PLATES

Fig. 12—Blanking die for rocker plate. Fig. 13—Piercing dies for rocker plate. Fig. 14—Blanking and piercing dies for control plate

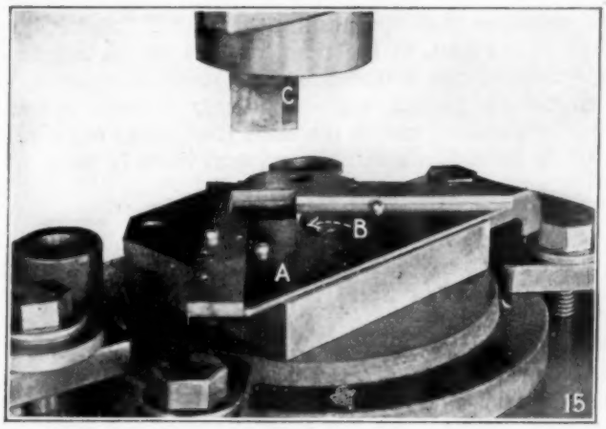


FIG. 15. TRIMMING DIE WITH REMOVABLE GUIDE PLATE

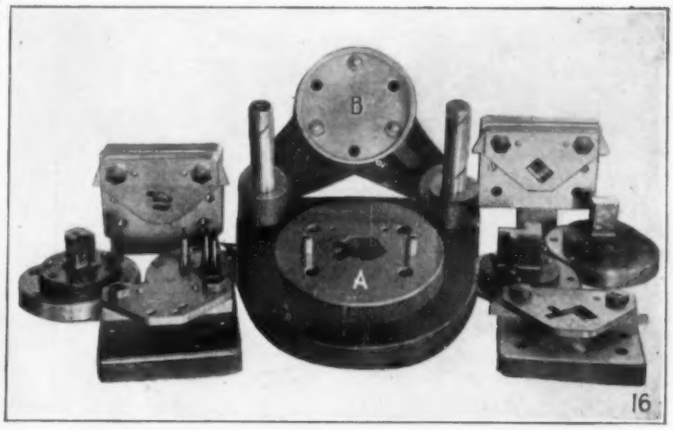


FIG. 16. DIE AND PUNCH BASE FOR INTERCHANGEABLE DIES

the proper position with the holes in the die, various fingers such as *H* and *I* are provided that may be bolted either to the stripper top plate or to the bed of the die. As will be seen from the few samples of work that are shown this die has enabled the shop to save the making of quite a number of expensive dies, and has produced very creditable work.

A number of bending dies are used in connection with the manufacture of these parts; one of the more simple of these, Fig. 18, is used on a foot press to produce the part shown at *A*. The straight blank is laid across the depression in the die *B*, and after being struck by the bending punch, the spring-operated ejector *C* raises it so that it may be readily removed by the workman.

A bent punching of more complicated form is shown at *A*, Fig. 19, and is formed by the combination bending die *B* and a punch *C*. The L-shaped form of punching is placed in the impression *D* of the block *E* fitting over the dowel pin *F*. This block is mounted on springs, so that when struck by the punch it retreats and the angle side *G* of the punch bends the two corners *H* and *I* of the punching. In the meantime the finger *J* of the punch has slipped under the plunger *K* of the die, and has drawn this out, which permits the end *L* of the punching to pass freely down to the base of the bending die. When the punch reaches the end of the stroke the plunger *K* by a tripping groove is permitted to slip through a slot in the side of the finger *J*, and immediately returns to its original position which extends across the groove *M* of the bending die. When the punch *C* begins to rise, the spring-operated center block *E* rises with it and draws the corner *L* up under the sliding ram *K*, and the pressure of the springs themselves are sufficient to produce this bend.

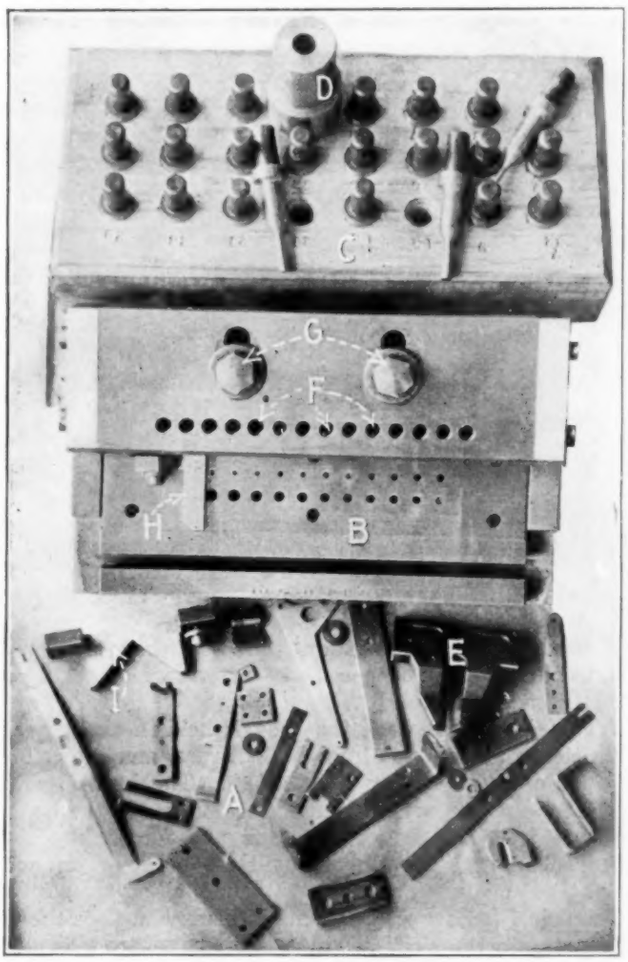


FIG. 17. TOOLS FOR GRADUATED SIZES OF HOLES

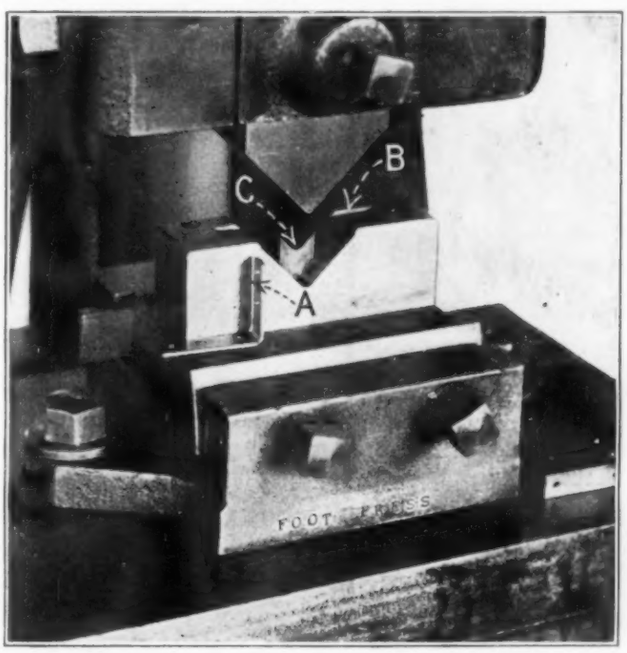


FIG. 18. FOOT PRESS BENDING DIE

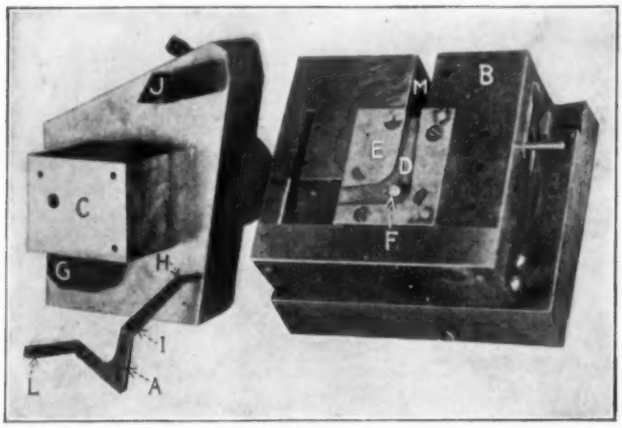


FIG. 19. A COMPLICATED FORM OF BENDING DIE

A small broaching die which is proving very serviceable produces a square hole in the part *A*, Fig. 20. This small piece, previously drilled, is slipped into the round holder *B*, which is then swung around on the indexing plate *C* until the lever *D* catches in the proper notch, which places it in absolute position under the punch. The square punch then passing through the drilled hole, shears the square hole at a single operation. The index

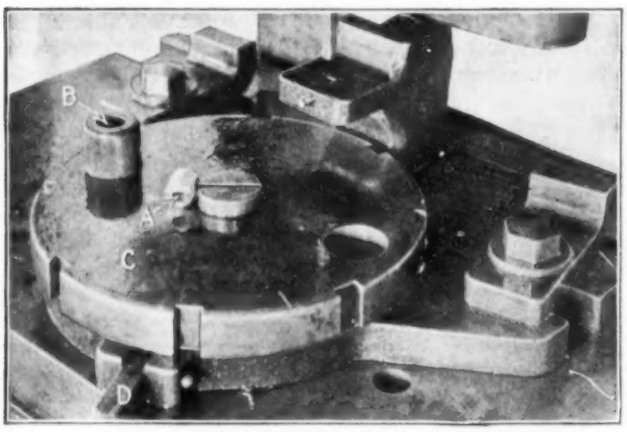


FIG. 20. SQUARE-HOLE BROACHING DIE

plate *C* has been notched at various points, as will be noted, as it was the intention to use this for future operations of a similar character, and drill it for holding blocks as eventual requirements shall dictate.

Junking an Obsolete Machine

By D. C. Cook

To my way of thinking, John R. Godfrey's friend Johnson, when he said in the former's article on page 1079, Vol. 50, of the *American Machinist*, "darned if I know which is the bigger jackass, you or the system," certainly hit the nail on the head. After being subjected to complicated systems for some time I have arrived at the conclusion that the "which" mentioned above, is the man who pays the systematizer.

About five months ago I bumped up against a routine that was "the straw that broke the camel's back." I had just taken over a department which had considerable work laid out for a lone power hacksawing machine of a doubtful vintage. During my first week the machine broke down and the operator in reporting the case remarked that the machine was out of commission about 50 per cent. of the time for repairs. A hurried inspection of the machine brought out the fact that it should be junked, and accordingly I made out a "*junking request*" and at the same time wrote out a requisition for a new machine, and sent them to the general foreman for his approval.

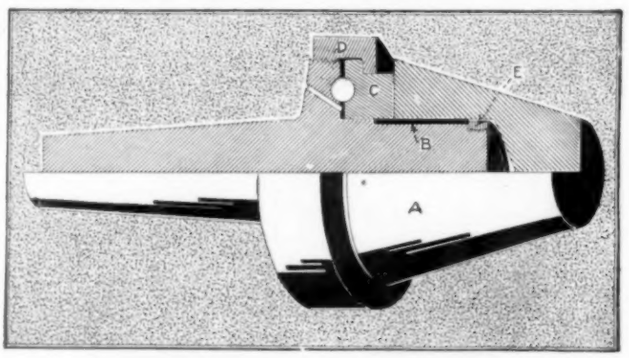
The general foreman, according to instructions, made a personal investigation of the case and with his approval the request was mailed to the Boss. He, in turn, sent it to the chief tool designer who, after an investigation, referred the matter to the toolroom foreman to ascertain whether the machine was repairable—just as if previous failures on the part of the machine were not sufficient evidence. After some deliberation, the toolroom foreman decided that the machine was beyond repair and sent his recommendation to the chief tool inspector, who after a "miking" approved the junking of the machine and returned the request to the chief tool designer in order that the tool records could be cleared.

The request was then sent to the cost department, and some individual, with a lean and hungry look, from that sanctuary is now going over the whole case in order, so the system reads, to "allocate the cost factors and close the account." This case has now covered a period of five months and, like the emblem that inspired the writing of our national anthem the hacksaw "is still there."

A Ball-Bearing Pipe Center

By M. Kester

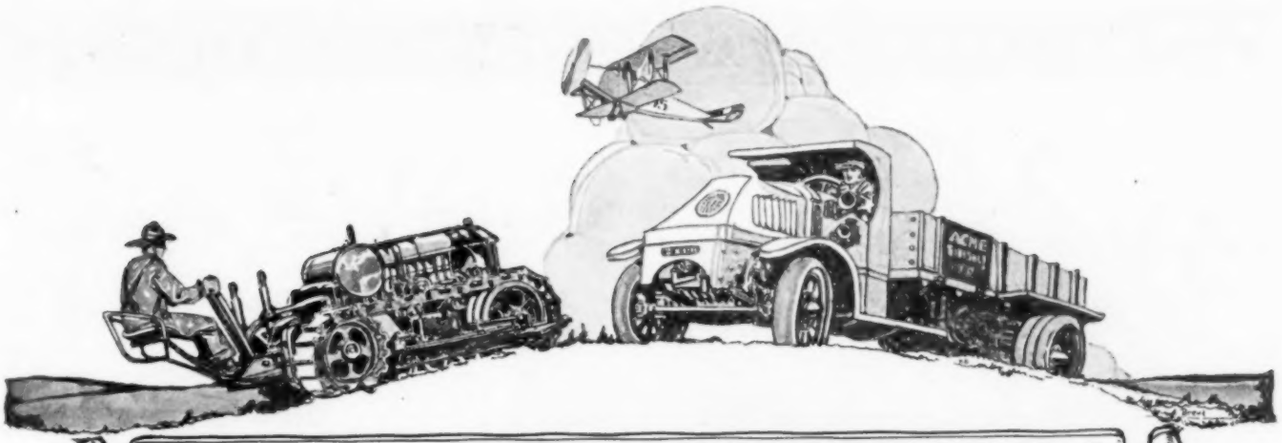
The sketch shows a nice little device to have in the shop if there is much hollow stuff to be handled in the lathe. The device needs little explanation. The cone *A* fits rather tightly on the brass sleeve *B*, as does also the hardened-steel collar *C*. The shell *D* is threaded to screw onto the body of the tool and is



BALL-BEARING PIPE CENTER

held from turning after adjustment has been made by tightening a small copper-shod setscrew which bears on the threaded part.

To assemble the tool, the body is held in an upright position, the balls put into the ball race, and the collar *C* put on, followed by the shell *D*. The brass sleeve *B* is now placed over the extended portion of the body, on which it is a free running fit and forced into the the collar *C*. The brass nut *E* is screwed on and tightened against a shoulder without binding the sleeve. The whole is now set in an arbor press and the cone *A* forced onto the sleeve. Suitable oil holes are provided for lubricating purposes.



AUTOMOTIVE CONSTRUCTION

The Hispano-Suiza Airplane Engine—II

By H. O. C. ISENBERG
Works manager Wright-Martin Aircraft Corporation, New Brunswick Plant.

All aluminum and bronze castings used in the engine are made in our own foundry which is under rigid metallurgical control. At the beginning this shop was furnished with castings made by the best producers of aluminum castings in the country but as a very high percentage of these would not pass inspection it was compulsory to develop foundry methods which would assure a sufficient supply of perfect castings. That these methods have been successful is proved by the fact that we are able to produce complete castings for 80 engines per day with an average loss through all causes of less than seven per cent.

WHILE pursuing this description of the foundry the reader must bear in mind that these are not ordinary commercial castings. For instance, the lower half of the crank case is over 12 in. deep and its wall thicknesses vary from $\frac{5}{32}$ to $\frac{7}{32}$ in. only; all inspection on aluminum castings prior to machining is exceedingly rigid and consists of gaging with standard gages, testing with water under pressure for cracks, and porosity tests with kerosene and compressed air at 80 lb. Further, weight tolerances are imposed on all the larger castings; for instance, the cylinder block must weigh 55 lb. plus or minus only half a pound. Making such accurate high-grade castings on a production basis has been attained only through the use of efficient personnel and machine equipment throughout with constant intelligent supervision. As cores enter largely into the making of the principal castings it perhaps would be as well to show some of our core making. As in all other core making the smaller cores are stiffened by the insertion of nails and small wires while the larger ones have core irons. The core irons for our large cores are made of $\frac{3}{16}$-in. iron wire which is bent in various bending fixtures, one of which is shown in Fig. 17. To the right in this illustration a number of the smaller bent sections are shown.

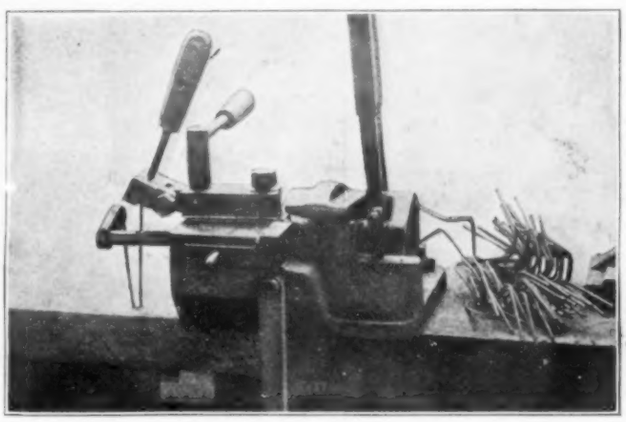
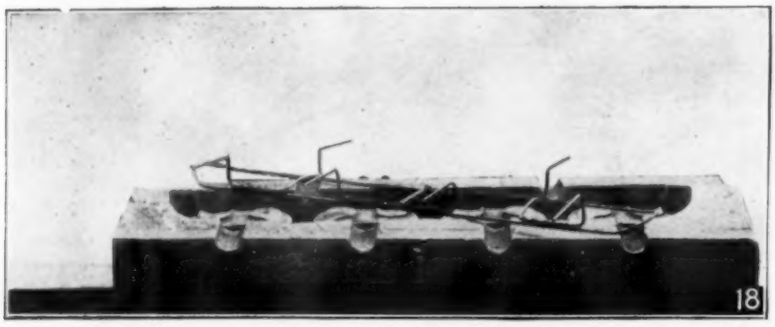
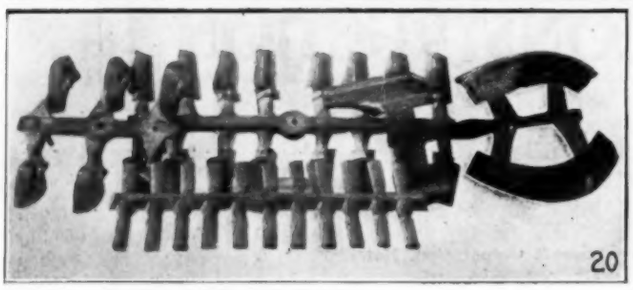


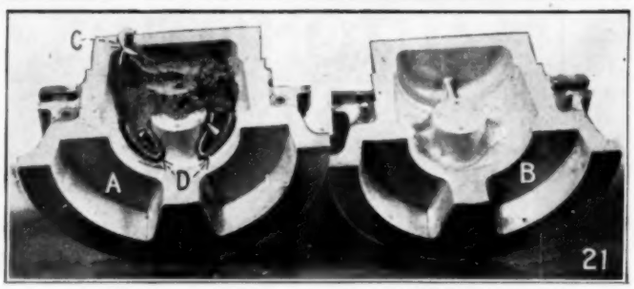
FIG. 17. BENDING FIXTURES AND CORE WIRES MADE WITH IT

In Fig. 18 is shown a gage for core wires for head cores and a completed head-core wire. It will be observed that the wire which forms the perimeter of this core wire is well braced by cross-wires which are bound to it by smaller wires. This produces a sort of lattice construction which braces the completed core very thoroughly. Cast core arbors are of course also used for certain cores. A gate of these used in the piston cores is shown in Fig. 19. Owing to the excessive shrinkage of aluminum, amounting to from $\frac{3}{32}$ to $\frac{3}{16}$ in., even in ordinary commercial work there is always trouble in casting heavy sections on comparatively thin sections. In high-grade work such as ours this trouble is much more in evidence. For the enlightenment of those who are not familiar with this work the action is as follows: The thin sections of the casting chill and set almost immediately and their shrinking draws the fluid or plastic metal away from the heavy portions such as bosses, etc. Where the risers can supply this extra metal the action is not noticeable but where the heavy portions are entirely surrounded by thin sections the action is very apparent resulting in change of form and shrinkage cracks. To obviate these objectionable features chills are embedded in the cores and molds abutting the heavy sections. The metal of the heavy sections is cooled by them at

AUTOMOTIVE CONSTRUCTION

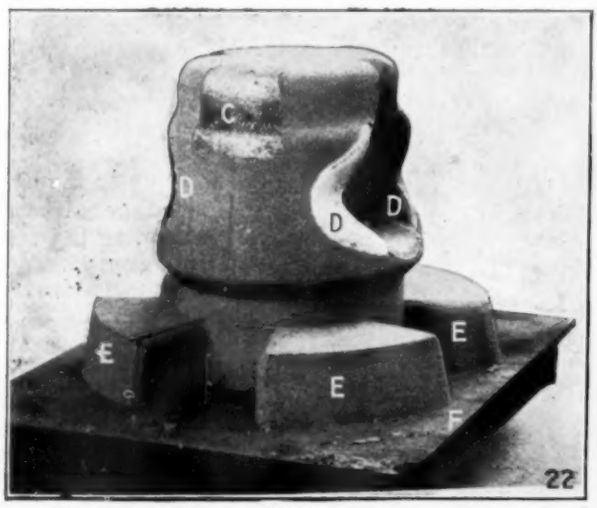


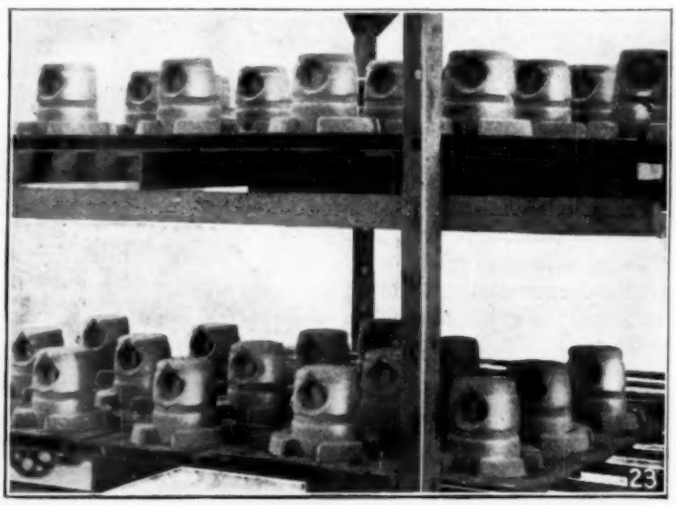


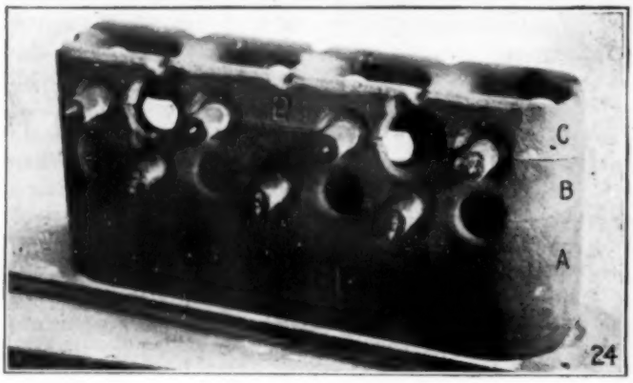


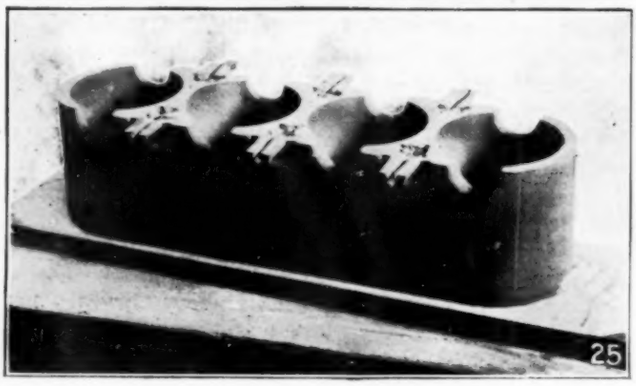
FIGS. 18 TO 25. GAGE, ARBORS AND CORES FOR AIRPLANE ENGINES

Fig. 18—Gage and completed head core wire. Fig. 19—Gate of piston core arbors. Fig. 20—Gates of chills. Fig. 21—Piston corebox. Fig. 22—Piston core complete. Fig. 23—Piston cores on rack ready for the core oven. Fig. 24—Complete water-jacket core. Fig. 25—Lower half of water-jacket core









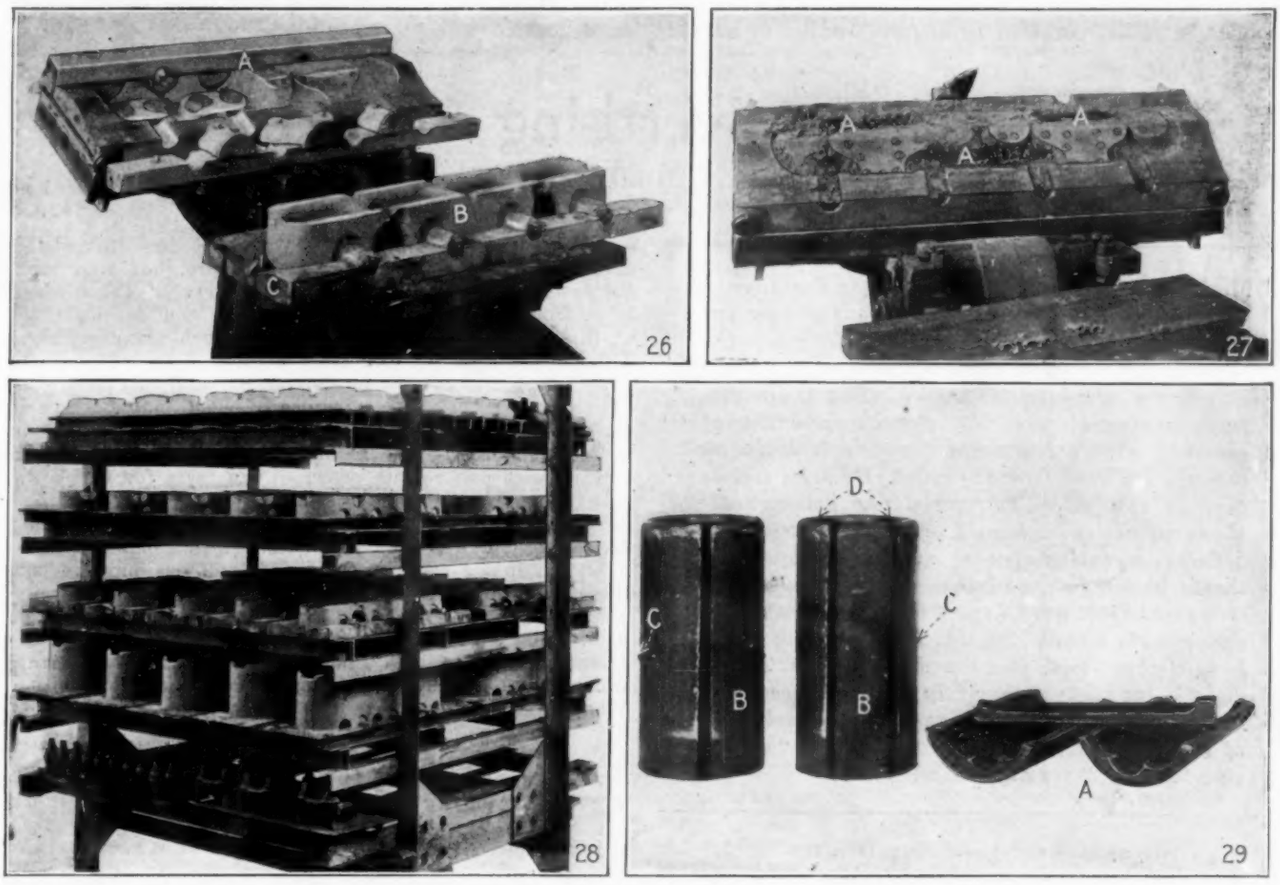
AUTOMOTIVE CONSTRUCTION

approximately the same speed as that in the thin sections with the result that the shrinkage is distributed uniformly throughout the entire casting and each part of the casting assumes its share of the total shrinkage.

Chills are made of aluminum, brass or cast-iron, cast-iron giving the best results. In thickness and area they vary with the thickness and mass of the metal they must influence. Experience alone, therefore, determines their size and thickness. In this work once the correct size, thickness and shape have been determined, they are made up in gates as we use a great number of them. In Fig. 20 are shown several gates of chill patterns.

In Fig. 21 at *A* and *B* are shown the two halves of a piston corebox. These coreboxes are dowelled and provided with swing bolts and wing nuts to facilitate handling and expedite production. It will be observed that the half box *A* has three chills placed at *C* and *D*. The function of those at *D* is that of chilling around the heavy metal of the bosses. Similar chills are also placed in the half box *B*. The chill *C* is not placed with the object of chilling the aluminum in the piston casting at this point but to prevent washing away of the core by the flowing metal when the mold is poured. The dark substance in the half box *A* is core sand which was placed to hold the chill *C* in place, as without this it would not stay put.

After the chills are placed in both halves the half boxes are assembled, an arbor similar to those shown in Fig. 19 is placed and the core finished. A drier plate is then placed over the open end of the corebox, the whole inverted and the box removed by drawing it radially. The core then appears as shown in Fig. 22. The chill *C* is the one to prevent the hot metal cutting the sand, while those marked *D* prevent unequal shrinkage in the internal bosses. When in the mold the core is of course inverted and supported by the lugs *E*. The drier plate is shown at *F* and an entire rack of piston cores ready for the core furnace in Fig. 23. One man can turn out 250 of the piston cores shown in Fig. 23. These are for the 180-hp. motor and differ from the one shown in Fig. 22 in the placing of chills for the wristpin bosses. It will be observed that those in Fig. 23 face the boss and do not partly surround it as in Fig. 22. The production of piston cores is 150 a day.



FIGS. 26 TO 29. A COREBOX AND SOME COMPLETED CORES

Fig. 26—Head corebox and completed head core. Fig. 27—Partly completed head core. Fig. 28—Water-jacket and other cores ready for the oven. Fig. 29—Composite iron and sand barrel cores for cylinders

The water-jacket core which is shown complete in Fig. 24 is the most intricate of all the cores entering into the engine. It is made up from three parts, *A*, *B* and *C* pasted together. In Fig. 25 is shown the lower half of the water-jacket core.

The reader will no doubt recognize the corebox shown at *A* in Fig. 26 as similar to the one shown in Fig. 13, in the first article of this series. At *B* in Fig. 26 is shown the completed head core in place in the drier *C*,

AUTOMOTIVE CONSTRUCTION

one of which was shown in Fig. 10 in connection with the pattern-shop description. This core, like others of the larger ones, is made in a molding machine.

In Fig. 27 the partly completed core is shown. At *A* is the filling of coke to accelerate the escape of the gases.

In Fig. 28, water-jacket and other cores are shown ready for the core oven. By the original method in use here, which was brought over from France, three men could produce as high as nine of these cores per day. Changes, however, were made in accordance with American production methods and now three men can produce 35 jacket cores in 10 hours. This is of course exclusive of pasting and trimming which gives work to four men for the same number of cores.

All metal, and part-metal sand cores are used in many instances. Of the latter a good sample is shown at *B* in Fig. 29 which shows a barrel core for a cylinder. The parts *A* are cast-iron about ⅜ in thick. They are arranged in a metal corebox with a space of about ⅜ in. between them.

The interior is then filled with sand and rammed up. After removing from the corebox a copper wire is twisted around the assembly as shown in the illustration at *C*. Two men can turn out 600 of these barrel cores in 10 hours.

Foreign Advertising Success*

By W. G. HILDEBRANT
Gotham Advertising Co.

Most American manufacturers, after deciding to spend a certain amount of money for overseas advertising, approach the problem in much the same frame of mind that the skeptic has when entering a spiritualistic seance. But the manufacturer considering the definite problem of securing export trade must approach it in an entirely different frame of mind. He must realize that he cannot appropriate a few dollars, cast about in some haphazard manner without any definite conception of what such an appropriation should accomplish, and then expect results. To many manufacturers, export trade seems a mystic and remote possibility which they think of as hedged about with innumerable peculiarities and difficulties; and yet they rely in many cases upon the recommendations and suggestions of solicitors of entirely unrelated publications as to the best way to solve these difficulties.

HAVING ascertained that there is a market for his product, the first thing a manufacturer must have to successfully sell that product abroad is a thorough knowledge of this market. If he will then apply the same sane, carefully thought-out and well-developed selling and advertising methods to the cultivation of this market that he applies to home trade, he can secure for a given expenditure more profitable results than he can at home. You may doubt this statement, but I hope to prove it by citing briefly a certain few foreign-trade campaigns.

There are a few conspicuous examples of how this has been done successfully. But because these familiar successes are those of huge organizations, such as the International Harvester, National Cash Register, Standard Oil, Singer Sewing Machine, etc., the smaller manufacturer concludes, without reason, that he is not in a position to follow the example of those potential leaders. This same line of argument applied to domestic trade would convince these same manufacturers that the most profitable thing to do would be to close their plants and cease striving to meet competition.

There are a number of interesting examples, however, of well-established manufacturers who, while they enjoy considerable business in this country, have not attained the magnitude of the firms mentioned above, but who have successfully developed their overseas markets. The speaker is personally familiar with the details and developments of the foreign campaigns of over 40 such manufacturers. These firms each produce from 1 to 50 different products which they market in foreign fields, and the following campaigns are cited as examples of what may be accomplished by the proper advertising of American products in overseas markets. The accuracy of the statements as to expenditures and results produced are facts for which the speaker can vouch. The speaker has chosen for examples campaigns very widely different in character, advertising articles as far apart as the poles, which demanded absolutely dissimilar selling policies, so that you may see how these products were sold by different methods in foreign markets, just as they must be sold here in the domestic field. The products referred to are typical. With one exception there was no unique, patented, exclusive feature which made it easy to overcome or exclude competition. What these manufacturers have accomplished others can do.

Examples of Successful Advertising

As the producers of machinery, machine tools, and metal-working machinery have, perhaps, in the past been our keenest exporters, the first example of successful advertising in foreign fields will be the case of a manufacturer of automatic machinery. Strange to say, that while American manufacturers realize the vital importance of controlling their own selling and advertising policies in this country, many of them unwisely leave this to their agents in foreign fields. But this manufacturer firmly adhered to the policy of carrying his own advertising in local technical and trade publications published abroad, whose circulation reached the buyers of his machines. Convincing and securing proper agents was the first step in this advertising campaign. This was accomplished by circularizing with photographic inclosures. Each photograph showed a specific feature of the machine, or its ease of operation. Certain English, French, German and Italian firms acted as his agents. The manufacturer refused to allow these firms to place his advertising but made contracts with the publishers, advertised his own name, trademark, and machine by constantly featuring them in trade-paper copy and consecutive circularizing, merely telling the buyer who were his exclusive agents in these countries. In this way he secured full value for every dollar spent. He was not paying to advertise his agent's name first and his own business incidentally.

His first year's appropriation was less than $5000, his second year's about $6500 and each year thereafter approxi-

*From and address delivered at the Sixth National Foreign Trade Convention, Chicago, Ill., Apr. 24, 1919.

mately $7000. This appropriation covered not only his publicity in trade and technical media, but also catalogs and special literature. Not a large appropriation, but his possible prospects being limited, his direct mail costs were consequently small. The machines were good, so good that foreign manufacturers copied them, but year by year sales increased. During the war his campaign continued. He had no machines to sell. His output was contracted for war purposes. Did it pay—this persistent advertising? The line is so well known that foreign agents are now camping on his doorstep. He can pick and choose the agent he wants in any territory. The agents who have survived war conditions are keenly anxious to continue their representation. Their attitude is well exemplified by one of them whose permanent American buyer, located in New York City, recently told a competitive manufacturerer, whose machines are not advertised abroad: "Yes, your machines are simpler, they certainly can stand up to their work, your terms are attractive, but we simply can't afford to drop this well advertised line." This buyer was placing a single order at the time for $14,000. Did advertising pay this manufacturer?

Appealing to Competing Agencies

You may say: "That's all very well, he had a big proposition, a big unit of sale and a large margin of profit; he could afford to spend part of his profits in advertising. But, how about my line? I manufacture small tools and equipment." Your problem is just as simple. True, you can't successfully appoint a single house as exclusive agent for any one country, but why not do as one New England manufacturer has done? Analyzing his market, he found that neither firms nor their operators would travel miles to buy from an exclusive agent the small attachment he made. The agent, on the other hand, could not afford to devote much time to pushing the sale of his product. There were three houses stocking the attachment and turning over a fair and regular annual amount of business. There were 17 good live organizations that should stock it. If they could be persuaded to do so, then proper advertising would compel smaller dealers to carry the tool and well placed publicity would increase its use. How to get these other 14 firms to stock was the problem. This problem was solved, and the sale of the product increased at the same time, by using space in the three leading English technical journals.

How the Problem Was Solved

An introductory piece of copy was run and followed each week with strong selling copy. Each week one advantageous feature of the attachment was presented, and the copy concluded with "Stocked by leading jobbers." Then followed the names of the three firms stocking the product. Competitors, noting this advertising and wanting to be listed, also stocked the tool. At the end of the sixth month, 11 of the 17 firms had placed stock orders. Each asked to be listed in the ads and the three original jobbers more than doubled their stock orders. Result, at a total expense of only 6¾ per cent., this manufacturer increased his sales in a little over six months to more than double the amount of his best previous year.

This same campaign with necessary modifications has been successfully carried out in every country where there are a sufficient number of metal-working plants to warrant it. The cost, figured on sales resulting from this advertising, varied from 6¾ per cent. to 9 per cent. Having attained the desired results and with stocks well established, advertising to reach the shops is instituted and consistently carried on. The copy, largely pictorial, features safety, speed and production attained with this attachment. Solely by advertising (publicity and follow-up work), without travelers, the export sale of this product has been increased from a few thousand dollars a year to the point where it is approximately 50 per cent. of the annual business of the largest firm in this line in the world.

Advertising a Small Tool Line

Again you say: "That's possible with a mechanical or patented specialty, but it can't be done with a deversified line of small tools." But it can, because it has.

One manufacturer in the East, producing small tools, who has never had a traveler, agent, salesman or representative in foreign fields, except in London, started advertising for export trade seven years ago. He spent less than $4000 the first year, using the three leading export papers published in this country and four local mediums published in England, France, South Africa, and one covering the Far East.

How One Manufacturer Has Advertised

Steadily each year this manufacturer has advertised. Steadily each year he has followed up his inquiries by letter and with printed matter, a series of small bulletins being used. Steadily each year his export business has grown. He keeps constantly, insistently, persistently impressing upon the buyer the prestige of this organization, its trademark, its trade name, the reliability of the products, the purpose back of the organization and the institution. This year this manufacturer's appropriation for export advertising, based not on hope or ideas, but on an average percentage of 3 per cent. of his export business, is over $16,000. Export advertising pays him. It pays him well as the above figures indicate.

Again you say: "Oh, yes, but that manufacturer has a trade-marked line, one for which there is practically a constant demand. There's always a demand for machinery, mechanical specialties and small tools, but my line is different. It's really something people can do without. In fact it's a high-priced luxury. I can't compete in foreign markets." Why?

What a Properly Coördinated Sales and Advertising Campaign Will Do

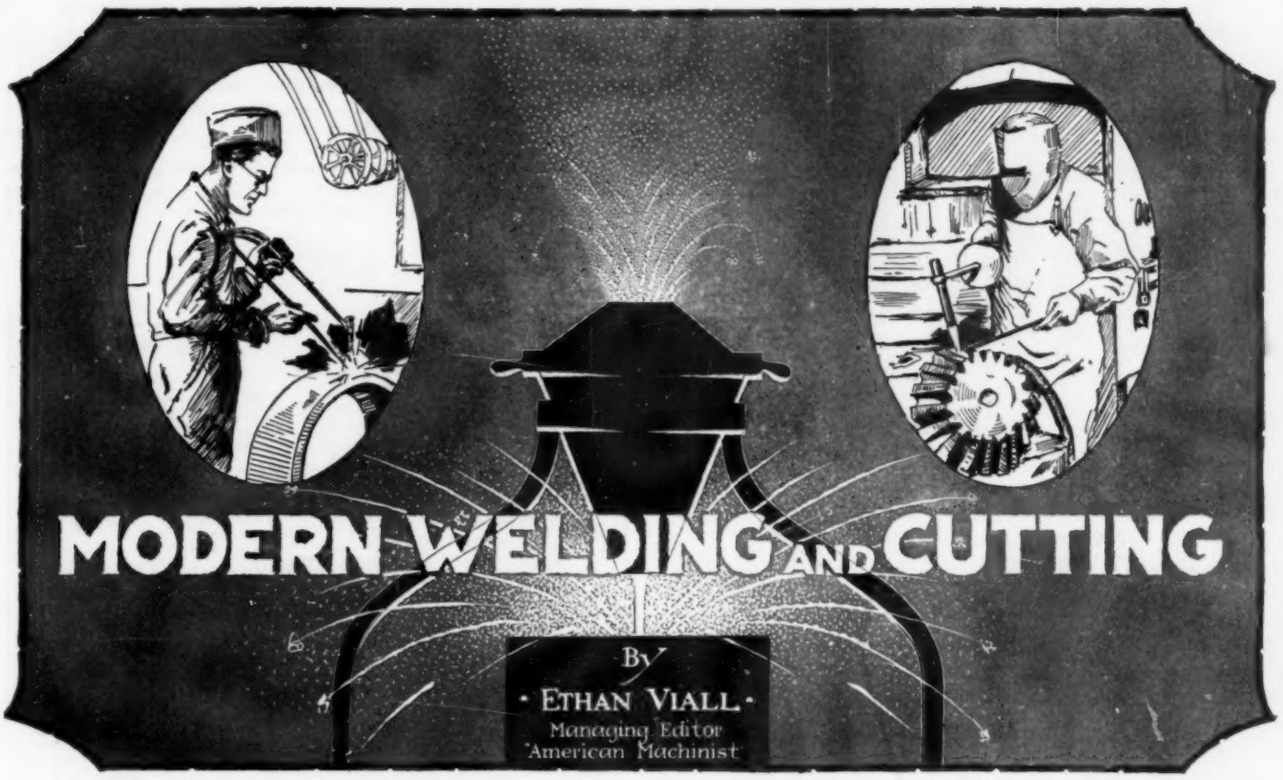
Is there a single worth-while product made in America which does not have to compete with cheaper, inferior brands? Isn't it a fact that usually the finer the product, the keener the competition? Have you no competitors in Chicago, New York, San Francisco or Peoria, Illinois? Do you throw up your hands and say, "I can't sell in these cities?" No, your sales and advertising plan secures your distribution and dealer coöperation and influences the ultimate consumer to buy your product, and in spite of competition you secure your share of trade. A properly coördinated sales and advertising campaign will do the same thing for you in your logical overseas markets.

In General

There are numerous examples of successful foreign advertising with which I am intimately familiar, but these campaigns are based on world-wide distribution and the advertising plans require large annual appropriations. The cases cited were chosen with the definite purpose in mind of showing the average manufacturer with a limited appropriation that he, too, by proper advertising, is in a position to secure foreign trade. There is no reason why properly planned, carefully coördinated, and well executed overseas advertising should not pay. True, there is no rule-of-thumb method or cut-and-dried plan which can be successfully applied to all products nor to all markets. But, study your market, analyze it, be sure there is a market for you before you plunge in. Plan your selling campaign. Plan your literature, your dealer helps, your follow up. Base these plans on your knowledge of your market. Make your overseas advertising a part of a sales plan. Use the right media and the proper appeal and your foreign advertising will succeed. There never has been a time when the American manufacturer had such an opportunity to secure export business. There never has been a time when this country needed export business as much as it needs it now. This trade can be secured. It can be secured on a basis which will make it both profitable and permanent. There is one instrument which will go far toward helping you secure it—that's advertising. It is not necessary to sell advertising to you. Properly planned and well executed advertising pays. Whether it be the glaring poster or hand bill in Northern China, or in the agricultural publications of Australasia, the Malay newspapers in the Dutch East Indies, the illustrated weeklies or dailies of Latin America, or in our own export publications, the right kind of advertising will pay.

Making U. S. Bronze Distinguished Service Crosses

1. Embossing Done in a 250 Ton Press *2. A Trimmed Cross Stamping*
3. Hand Finishing the Crosses *4. Sewing on the Ribbons*



XV. Gas-Torch Welding and Cutting Outfits*

The illustrations and descriptions of the various outfits and assemblies used for welding and cutting, begun in a previous article, are here completed. Only enough are shown to cover the field without undue repetition. These articles have now reached a point where instructions for actual gas-torch welding work may be taken up. In consequence our next article will show how to weld some of the simpler jobs.

CUTTING torches are lighted in the same way as are the welding torches. In most cases, however, the oxygen pressure to the preheating flame has to be several pounds higher, on account of the drop after the cutting jet is turned on. The apparatus used for cutting is also set up in the same way as for welding, as will be seen from the typical Oxweld cylinder outfit shown in Fig. 159.

Where large amounts of oxygen are used for cutting or welding, it is well to have a centralized source of supply so arranged that the flow of oxygen need not be interrupted at any time, and will be ample for all demands. For this purpose, the Oxweld company has designed the oxygen cylinder manifold shown in Fig. 160. Oxygen from this manifold may be piped anywhere in a plant exactly the same as the acetylene is. It eliminates the enormous amount of handling necessary in supplying full cylinders and removing the empty ones from each individual station. The manifolds are so arranged that each half operates independently, making it possible to provide an uninterrupted supply of oxygen. If desired both halves may be operated in unison. These manifolds are made in four sizes to accommodate 6, 10, 20 and 30 cylinders respectively. Each manifold will handle cylinders of either 100- or 200-cu.ft. capacity without any additional

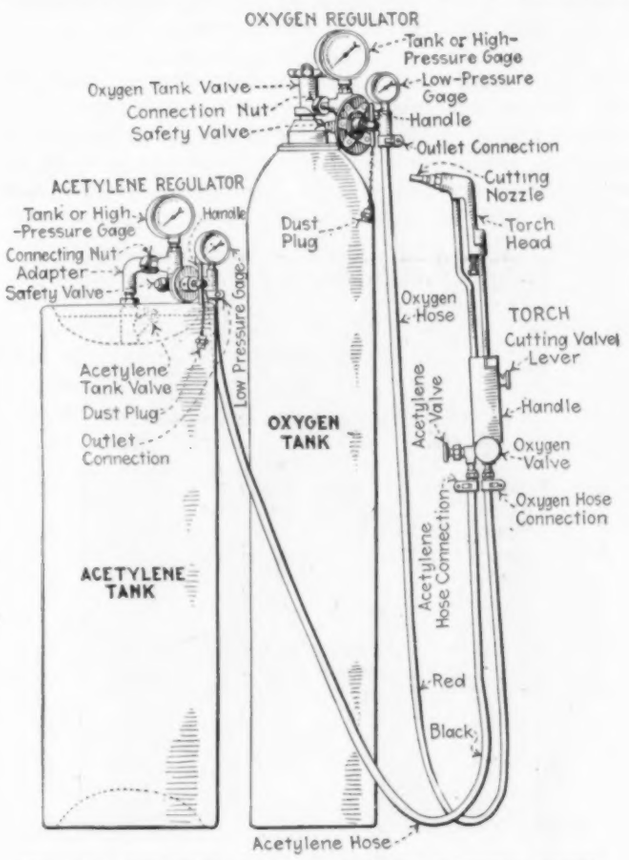


FIG. 159. TYPICAL OXY-ACETYLENE CUTTING UNIT

*For the author's forthcoming book, "Welding and Cutting."

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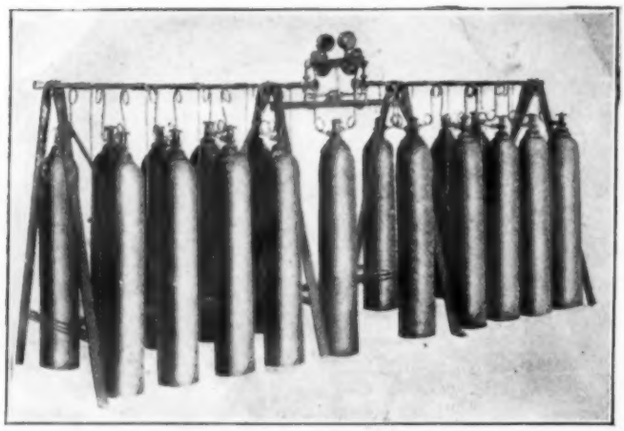


FIG. 160. OXWELD OXYGEN-CYLINDER MANIFOLDS

change or adjustment. They have two constant pressure regulators, one of which is for relief service.

Acetylene cylinder couplers or manifolds are used for the same reason as are those for oxygen. A number of Prest-O-Lite acetylene cylinders coupled together is shown in Fig. 161. These are valuable where large-size torch tips are used more or less continuously, since the capacity of the cylinders supplying acetylene should be at least seven times the hourly consumption. Where the hourly requirements are from 61 to 75 cu.ft. of acetylene, 5-WC or 2-WK size cylinders should be used.

Complete Working Outfits

A welding or cutting outfit may consist of the bare essentials, or be so complete as to include everything that will be needed to care for any job that will come along. The outfits may also be of either the stationary or the portable type, or a combination of the two. If of the stationary type, there will naturally be included many things such as holding jigs and fixtures which do not ordinarily belong to the strictly portable type. Two typical lists of parts and material for the ordinary run of work, where gas cylinders are used, are here given. These lists are taken from the catalog of the K-G Welding and Cutting Co., New York.

FIG. 161. PREST-O-LITE ACETYLENE-CYLINDER MANIFOLDS

Oxy-Acetylene Cutting Unit

1 cutting torch, standard size, with four interchangeable tips of graduated sizes.
1 high-pressure oxygen regulator, with 3000-lb. gage for cylinder pressure, 300-lb. gage for working pressure and one reducing valve with connection for hose coupling and needle valve.
1 acetylene-pressure regulator with 400-lb. gage for cylinder pressure, 60-lb. gage for working pressure and one reducing valve with connection for hose coupling and needle valve.
25 ft. high-pressure, copper-covered oxygen hose.
25 ft. steel-covered gas hose.

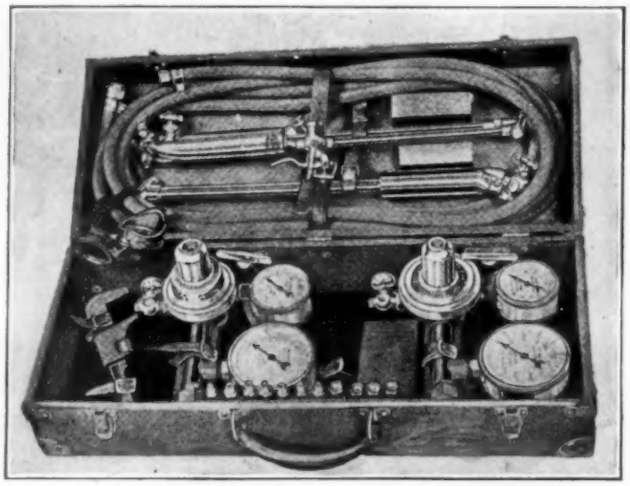


FIG. 162. CARRYING CASE FOR WELDING AND CUTTING OUTFIT

FIG. 163. GOGGLES FOR GAS-TORCH WORK

1 pair colored goggles for operator.
1 pair fireproof gloves.
2 wrenches and flint lighter, instructions, etc.
1 leather instruction and memorandum book.

Oxy-Acetylene Welding Unit

1 welding torch, standard size, complete with eight interchangeable tips of graduated sizes.
1 low-pressure oxygen regulator, with 3000-lb. gage for cylinder pressure, 60-lb. gage for working pressure and one reducing valve with connection for hose coupling and needle valve.
1 acetylene-pressure regulator with 400-lb. gage for cylinder pressure, 60-lb. gage for working pressure, and one reducing valve with connection for hose coupling and needle valve.
25 ft. red corrugated-rubber oxygen hose.
25 ft. black corrugated-rubber gas hose.
1 pair colored goggles for operator.
1 pair fireproof gloves.
2 wrenches, 1 flint lighter, instructions, etc.
10 lb. cast-iron rods.
10 lb. Norway iron for welding.
2 lb. aluminum rods.
1 lb. cast-iron flux.
½ lb. aluminum flux.

It, of course, is not necessary for a user to purchase two complete units if his work does not warrant it,

as these may be judiciously combined. For instance, the welding unit may be used for either welding or cutting if a cutting torch and a high-pressure oxygen regulator are added. It is very convenient where portable apparatus is used to a considerable extent over an extended territory, to have a suitable carrying case for the smaller parts. This may consist of a chest attached to the cylinder or portable truck, or of

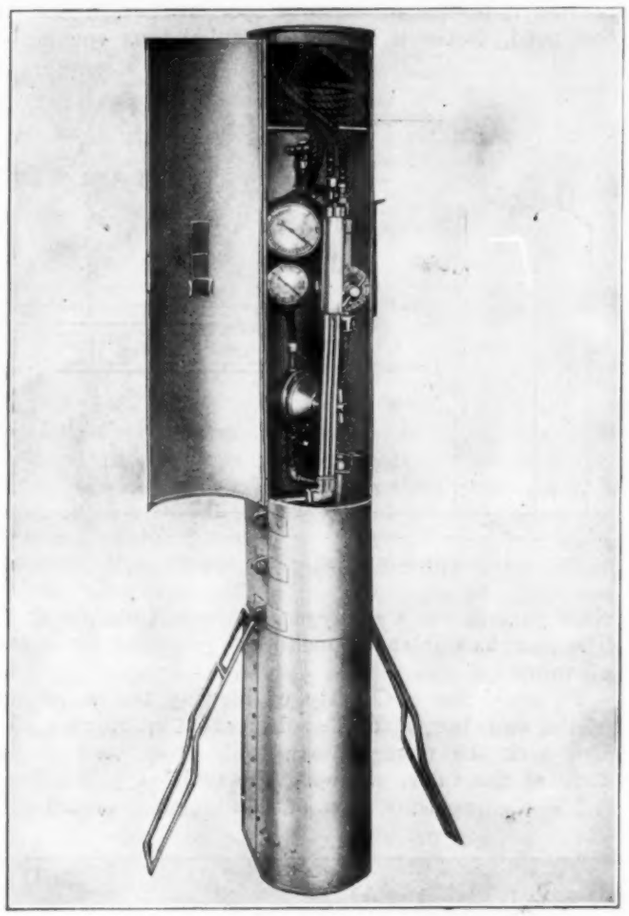


FIG. 164. EMERGENCY-CUTTING OUTFIT

a hand case, such as shown in Fig. 162. This case and outfit is sold by the Air Reduction Sales Co., New York, and holds everything necessary for immediate attachment to the cylinders and starting to work.

It has been previously mentioned that it is not advisable to place gas cylinders so that they may be knocked over. If they have to be stood up near the work, it is best to chain them to a post or brace them up in some way. A portable truck is of course, the best of all where outfit must be moved about. Such a hand truck has already been shown. Practically every firm making gas-torch supplies sells a similar one.

A very important part of any gas-torch outfit, is a pair of suitable glasses or goggles. These should not be merely dark glasses, but the lens should be made expressly for work of this kind. Cheap glasses are dear at any price, as the result may be ruined eyesight from the intense glare of the hot metal or from injurious rays. The glasses may be of either the spectacle or the goggle form, but the lens should be the same in either case. Glasses may be obtained from practically any of the firms mentioned in the various descriptions. The goggle form of glasses has the advantage over those of the spectacle type in that they will better protect the eyes from flying or glancing particles of hot metal or sparks. It is well to have the colored lens protected by clear glass. A pair of goggles is shown in Fig. 163. These are of a very satisfactory form. They are light and all parts that come in contact with the skin are covered with soft cloth. The guards are made of aluminum screen. Never on any account use goggles with guards made of celluloid. If the glasses used can be employed for long periods of time without the eyes feeling "dazzled," or if they can be removed without white spots appearing before the eyes, then they are all right. Otherwise get others that are better fitted for the work and your eyes. A darker lens is usually used for welding than for cutting and sometimes it is advisable to use different glasses for different metals. These will enable the operator to see more clearly when the glare is not so intense.

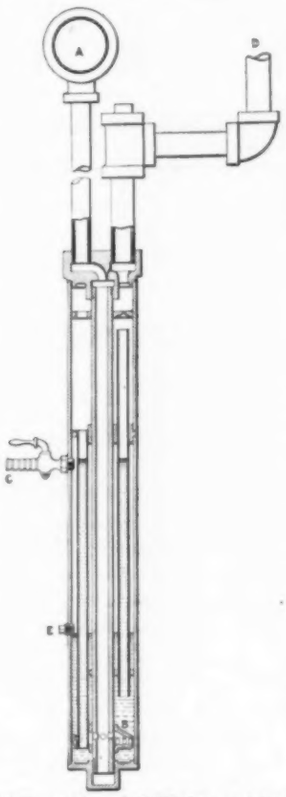


FIG. 166. OXWELD LOW-PRESSURE HYDRAULIC BACK-PRESSURE VALVE

Fire-fighters often need to cut through steel or iron window bars, shutters, steel plates or sheathing, in order to rescue imprisoned persons or to get at a fire advantageously. For this purpose the Davis-Bournonville Co. supplies a very compact apparatus, shown in Fig. 164. The metal case is 6½ in. wide, 14 in. deep and 50 in. high. It contains a 40-cu.ft. cylinder of acetylene, a 50-cu.ft. cylinder of oxygen, and a complete cutting unit with extra length of hose. Handles on each side of the case provide means for easy carrying by two men, and these handles placed as shown, when in use, insure stability. The complete outfit weighs 125 lb.

A complete two-station welding and cutting outfit of the stationary type, using an acetylene generator and oxygen cylinders, is shown in Fig. 165. This can be extended to include any number of individual stations,

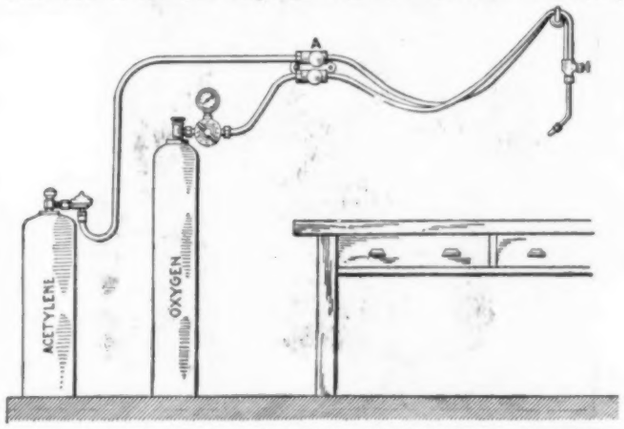


FIG. 167. OXY-ACETYLENE LEAD-BURNING OUTFIT

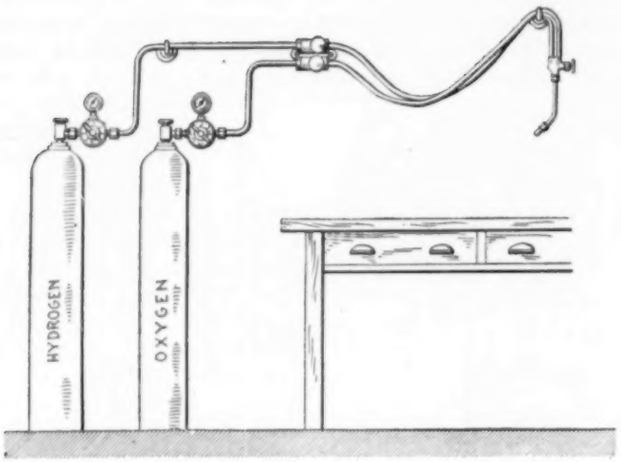


FIG. 168. OXY-HYDROGEN LEAD-BURNING OUTFIT

according to the size of the generator employed. It is advisable to place the acetylene generator in a separate room or building. The oxygen cylinders and regulators are placed within easy reach of the workers.

Hydraulic back-pressure valves should always be connected to the individual acetylene pipes, as shown, to avoid the danger of a flashback or an explosive mixture entering the acetylene line. An Oxweld low-pressure back-pressure valve is shown in Fig. 166. In some quarters it is thought that such a valve is not needed where positive-pressure torches are used, but this is not true, as the danger is always present when the oxygen pressure is greater than that of the acetylene or which, through accident, may become greater. An obstruction in the nozzle of the torch, or clogging of certain passages is apt to force the oxygen into the acetylene line. There are also other conditions which may cause a serious accident. While mechanical valves may help, they are not so reliable as hydraulic valves and should not be used on shop lines. In the valve shown, the acetylene enters at *A* and bubbles out at *B* where it rises to the surface of the water seal, and normally goes out of the hose valve *C*. The depth of the water through which the acetylene bubbles is sufficient to cover the tube leading to the outside air. If there is a backward flow of oxygen, the pressure exerted on the surface of the water lowers its level, causing it to rise in the tube open to the air, and, if continued, forces it out of the tube, thus opening a clear passage for the oxygen to the outside air at *D*. The acetylene inlet meanwhile is protected by a seal of water.

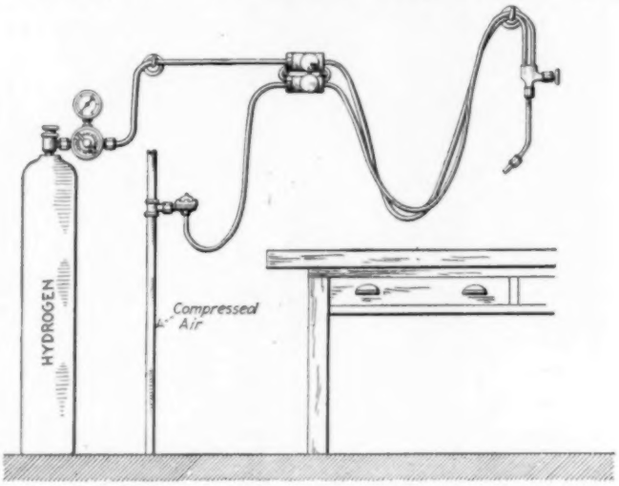


FIG. 169. HYDROGEN AND COMPRESSED-AIR OUTFIT

To avoid the possibility of blowing the water out of the seal, the valve is so designed that in case of a blow-back the water automatically flows back to the body of the valve, renewing the seal.

The high-pressure valve of this type is provided with

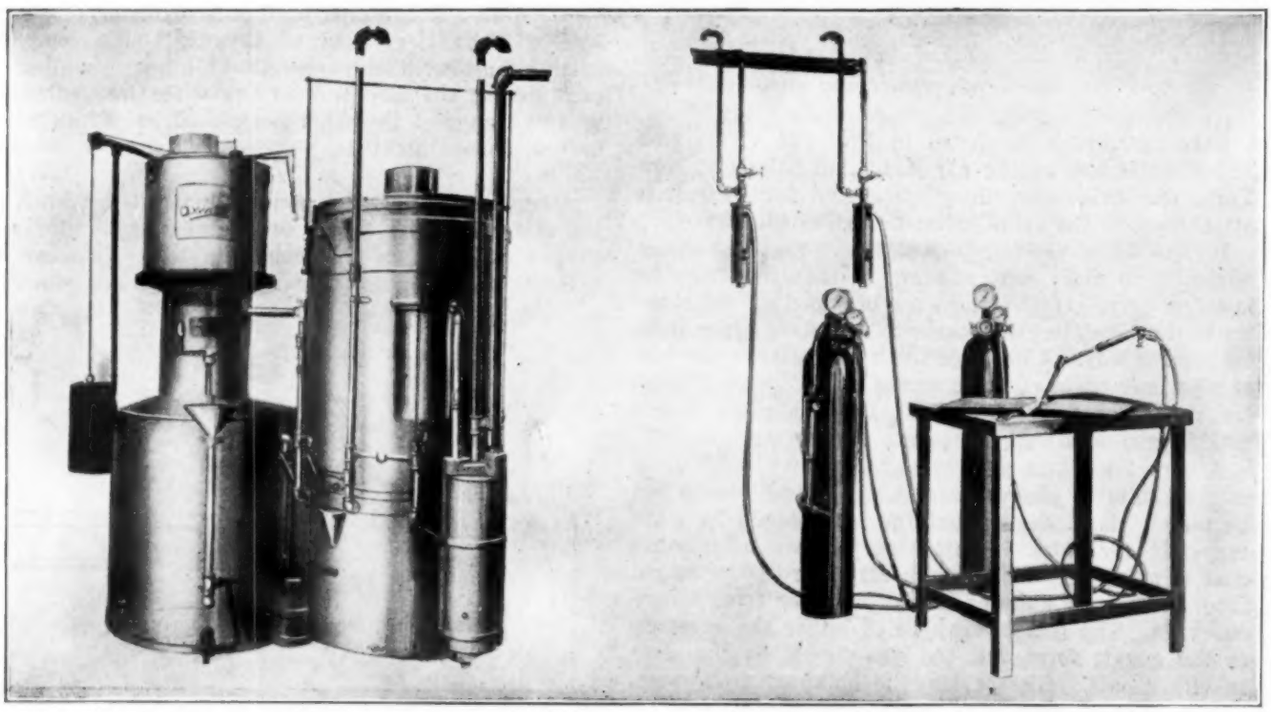


FIG. 165. OXWELD ACETYLENE GENERATOR AND OXYGEN CYLINDER TWO-STATION OUTFIT CONNECTED FOR WELDING AND CUTTING WORK

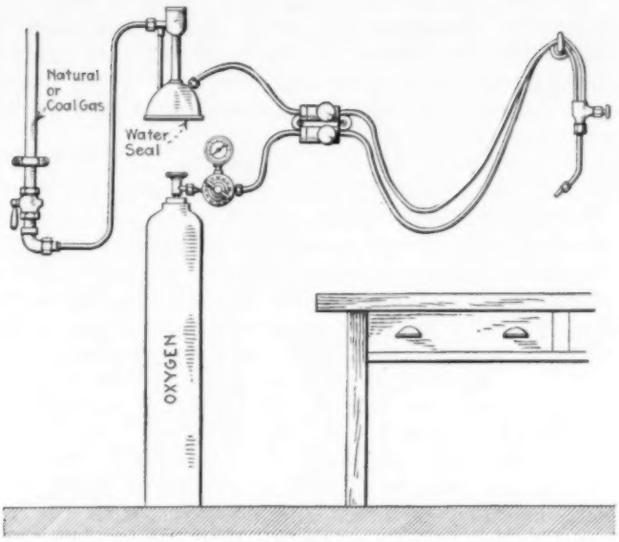


FIG. 170. OXYGEN AND ILLUMINATING GAS OUTFIT

a ball check seated under water, which effectually prevents an excess pressure from working backward into the generator. It is also supplied with a relief valve of ample size to carry off any excess pressure which may accumulate in the body of the hydraulic valve.

Both the high-pressure and low-pressure valves should be kept full of water up to the screw plug *E* which is provided to regulate the height of water when filling.

Lead burning is practically the same as any other welding work, except that the melting point of lead (620 deg. F.) calls for a much smaller flame. The same outfits intended for lead burning may be used for welding jewelry, small metal parts of various kinds, or for brazing work in some cases. On account of the torch itself being made small and as light as possible, it is customary to have only an oxygen valve on it, the gas and oxygen valves being placed in a "bench block" placed about midway between the torch and the sources of supply. For lead burning alone, it is usually advisable to use some gas combination giving less heat than oxy-acetylene, such as oxy-hydrogen, hydrogen and compressed air, oxygen and illuminating gas, or others. In order to assist the would-be user, several typical set-ups, taken from the Imperial Handbook, will be shown.

FIG. 171. MANUFACTURING JEWELERS' AND DENTISTS' WELDING OUTFIT

An oxy-acetylene combination is shown in Fig. 167. This shows the bench block *A*, screwed to the wall, which in many cases is the better way. However, it is well to have this block in easy reach of the operator. The oxy-hydrogen set-up is very similar, as shown in Fig. 168.

A hydrogen compressed-air unit is shown in Fig. 169. A constant air-pressure regulator is shown attached to the air line. In Fig. 170 is shown an oxygen-illuminating gas combination. A water seal is used on the gas line as a safeguard and to act as a scrubber to some extent.

A very light outfit, intended for jewelers, dentists, or experimental laboratory work, is shown in Fig. 171. The bench block differs some from the ones just illustrated. The torch itself is almost as light and is about the size of a large fountain pen. With the bench block close to the operator, the torch valve is not needed. This outfit is made by the Davis-Bournonville Co. A very convenient feature is the torch-holding clip, shown at the top of the bench block. This obviates the necessity of laying the torch down at any time, with its attendant danger of fire.

Static Electricity and Its Effect on Induction Motors

By L. E. Wood

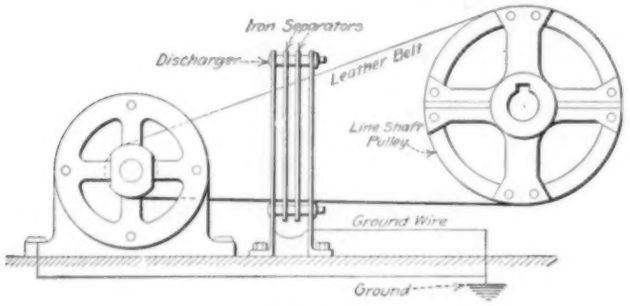
In the manufacture of bronze and aluminum powder, the air is a dense fog of suspended metal dust, which penetrates anything and everything. It is quite natural that the air becoming very dry, especially in some seasons, produces a large amount of static electricity on large leather belts, and in order to prevent serious trouble it is necessary to take every precaution to prevent the production of static. It may be said in general that the production of aluminum powder is always more or less attended by the risk of explosions, the consequences of which may be readily imagined if a spark or flame were to ignite the powder.

In the plant with which the writer has been connected, 50 hp., three-phase, 60-cycle, squirrel-cage motors driving line shafting through leather belts were housed in separate rooms kept as dust-tight as possible. Shortly after putting the motors to work it was noticed that a large amount of static was being produced which at times was so strong that it was unpleasant to approach within 3 ft. of the belt. After two weeks' constant running, the first of the motors put to work broke down, apparently grounded. Just prior to the breakdown small explosions occurred in the motor, emanating from the bottom portion of air gap, the cause of which was put down to static from the belt.

In order to prevent this static in the belt, a discharger was made and placed as shown in the figure. The discharger was made as follows: Four pieces of $\frac{1}{8}$-in. x 1-in. iron were made up to form a grid, the two

outside pieces being long enough to reach the floor to which they were secured by coach screws and the two inside pieces long enough to span across the belt as near the motor pulley as convenient. The four pieces were separated 1½ in. by pieces of ¾-in. iron pipe, and held together by ¾-in. bolts passing through them, the top bolt also holding two angle plates made of ¼-in. x 1-in. flat iron, which fastened the top part of the discharger to the wall. The discharger was grounded independently and placed as near the motor as possible.

This device, by bridging both sides of the belt, makes it impossible for static to be produced and is a distinct advantage over such makeshifts as a piece of wire or an arc-lamp carbon holder placed on either top or bottom



TATIC DISCHARGER DIAGRAM

side of the belt. These only protect one side of belt, and in places where static is acute do not afford sufficient protection. This discharger completely protects the belt and no trace of static can be detected.

After the installation of this device, motors which had been continually breaking down ran for a period of 18 months before another breakdown occurred, which, from symptoms observed just prior to the complete failure, was attributed to static phenomena in the motor itself. After the motor had been removed to the repair shop, tests were made with a 1-in. spark induction coil which easily discharged through the punctured insulation of the stator winding. The star connection was opened, and the test applied to each coil until the three faulty ones were located, which when removed from the slot plainly revealed the punctures through which the winding was eventually grounded and of course broke down. On rewinding the stator a corona leaf consisting of tin foil was inserted in each coil and the whole grounded to a wire ground-ring fastened at intervals to the stator frame. The use of the corona leaf effectively prevents static being produced in the motor itself.

It may be asked why totally inclosed motors were not used. They were considered, but it was decided that the present motors could be made quite as free from a breakdown by fitting the corona leaf in the winding to prevent static in the motor itself with the discharger to take care of the belts. It is questionable if totally inclosed machines would be immune from the same trouble unless fitted with the corona leaf.

Time-Study Man or Rate-Setter

BY W. N. ALLEN

"A rose by any other name would smell as sweet;" but when the word rose is used, a certain impression is conveyed to the mind which no other name can give. If the word rose is used as an adjective in conjunction with bud an entirely different impression results.

In some shops, a time-study man simply makes time-studies, a rate-setter sets rates, and a speed-boss is responsible for speeds of the machines. In others, these terms are used to designate men whose duties may embrace one, or any combination, of the above-mentioned functions.

Then there is the kind of position like that held down by our friend William as related on page 939 of *American Machinist*. This man, hired as a rate-setter, must be of such caliber that in addition to speeding machines correctly, making time studies, and setting rates, he will understand the products so thoroughly that he will be able to recommend a change in design if such a change will result in increased production. He must be able to check up the sequence of operations, the routing, the tools, the method, the materials, the supply, and the inspection. The information thus obtained must be written up in the form of a report, intelligently and in good form. Often this data must be combined and compared with that of similar jobs, tables, alignment charts, etc., and special slide rules made up to cover future operations of the same class. To summarize, positions of this kind call for men to investigate, analyze, compare and recommend with the prime object of increasing and improving production.

The terms "rate-setter" or "time-study man" do not adequately convey the scope of this class of work. It is more like calling a rose bud a rose. These men are doing production engineering and work under their chief who in most shops is called "production engineer." Draftsmen do drafting work and report directly to the chief draftsman. Why not call these men "production engineers" and elevate the title of the "production engineer" to "chief production engineer?"

If the work is functionalized and the men in question are not engineers but simply do time-study work, rate-setting, or speed-bossing, let them be called time-study men, rate-setters or speed-bosses.

Whatever they are eventually called, the titles of efficiency man or engineer, with all the old sores which they open up in the minds of many unfortunate experimental patients, should not be added as another burden to the already heavily loaded time-study man or rate-setter.

How to Prevent Oil From Discoloring Finished Surfaces

BY SEYMOUR SCHREITER

On page 802, Vol. 50, of *American Machinist* you ask for suggestions on preserving the appearance of machines and preventing oil from caking on and giving the finished surfaces a dirty brown color. I think the principal reason for this trouble is that there is not enough attention paid to the cleaning of machines.

In the shop where I am employed each man is required to clean his machine thoroughly after using so it will be clean for the next man. At the end of each week the men are allowed half an hour to clean machines and at that time they are gone over with waste well soaked in kerosene which removes all the oil and dirt and quickly evaporates, giving the machine a good appearance and keeping the ways and other polished parts clean and bright. There are machines here that have been in use for years and yet show no signs of discoloration.

A Pair of Cams of Unusual Form

By ELLSWORTH SHELDON
Associate Editor *American Machinist*

In modern machine shops cam-generating and cam-cutting machines are common, but in the old days the duty of laying out and making special cams of whatever kind required, usually devolved upon the toolmaker or machinist, and any constructive work of this nature was not infrequently preceded by, or attended with, a conference in which the boss and all hands offered their views and arguments with freedom and sometimes fervor. While the method may not have been in accord with advanced ideas of efficiency the results obtained usually represented a composite of the best mechanical judgment available in the shop where the work was done, and compared not unfavorably with the product of some of the more advanced engineering departments of the present day.

A NUMBER of years ago I was delegated to replace a pair of cams that had been in service for a long period on a special machine, one of the features of which was a pair of dials that carried the work from one station to another, operations being performed at five of the eight stations.

These dials were flat disks of cast iron turning in a vertical plane, each being mounted upon the end of a short horizontal shaft, the axes lying parallel to each other and at a distance apart which brought adjacent edges of the disks close together.

Eight sets of jaws were set into the periphery of each disk and they were operated by a stationary cam attached to the frame to hold the pieces securely from the feeding-in to the final or assembling station. The product of the machine was a two-part piece made of sheet metal, and the blanks were fed into the jaws at the two stations lying in a horizontal plane at the level of the axes of the dials, or, in other words, at the two stations which were at the moment farthest apart.

Movement of the Dials

As the movement of the dials progressed operations on the blanks were performed in sequence to fit each part to the other until at the stations opposite the feeding-in point the two parts came together, were assembled and were thrown out of the machine, a piece thus being completed at each movement of the machine after all the working stations had been filled.

The dials were indexed around (in opposite direction) through successive steps of 45 deg. each, and as the indexing time was lost time so far as production was concerned—all operations being performed while the dials were at rest—one problem of the original designer had been to accomplish this movement in the shortest possible time.

The machine was designed more than 50 years ago, and though its somewhat intricate movements were a marvel of ease and efficiency, its parts were much heavier than in the case of more modern machinery of similar nature. The indexing dials were separate pieces of cast iron keyed to the ends of the shafts opposite to the work dials, and, as I remember the machine, these shafts were also of cast iron integral with the work dials.

The work dials being about 24 in. in diameter and the indexing dials nearly as large, each unit constituted a rather husky chunk of material to stop and start 50 times a minute, especially as three-quarters of each period must be given to rest.

Besides indexing these parts quickly they must be held firmly during the rest period in which the operations were performed, and to accomplish this double purpose with a minimum of parts and lost time the designer had used a pair of barrel cams mounted upon a transverse shaft. The arrangement, as viewed from the back of the machine, may be seen in Fig. 1, *A* being the indexing dials and *B* the cams, which were alike except that they were of opposite hand.

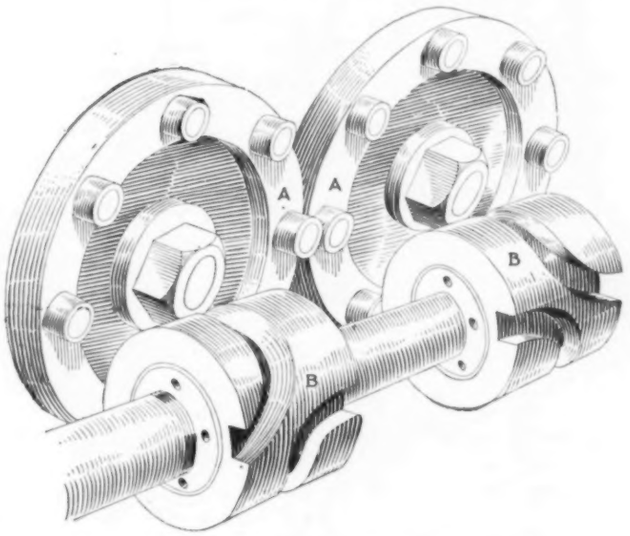


FIG. 1. RELATIVE POSITION OF CAMS AND DIALS

The original cams of cast iron had been in daily service for upward of 25 years and had seen much repairing and doctoring. The raceway in each cam had a regular picket fence, of what we used to call before the war "dutchmen," of varying sizes, with a special large corner post wherever the direction of movement changed abruptly, and these inserts had been "fixed" so often and so drastically that the old cams, considered as a guide in making new ones, were about as serviceable as would be a china egg in an omelette.

The radius of the roll path was, I think, 10 in., and the rolls $1\frac{7}{8}$ in. in diameter and $1\frac{1}{4}$ in. long. The rolls turned upon studs that were shouldered into the index dials and held by a nut upon the other side, the studs having a head slightly larger in diameter than the body and about $\frac{1}{8}$ in. thick, which was recessed into the roll so that it did not project beyond the end of the latter.

The first step in making the new cams, which were of tool steel, was to determine the minimum allowable

length, and as the cam must necessarily receive the incoming roll before discharging the outgoing one this length must therefore be greater than the chord of 45 deg. to a radius of 10 inches.

This length is 7.65 in. approximately, but as it was deemed advisable to add a liberal allowance to this in order to insure a long life to the cam and smooth working throughout the indexing movement, the cam blanks were made 10 in. long.

The pieces were bored and finished to size in the usual manner. A recess was made around the bore at each end of each blank for a ring nut which was threaded to the shaft, and provided means of adjusting the cams endwise upon the shaft. Such movement of course altered the position of the dials and thus

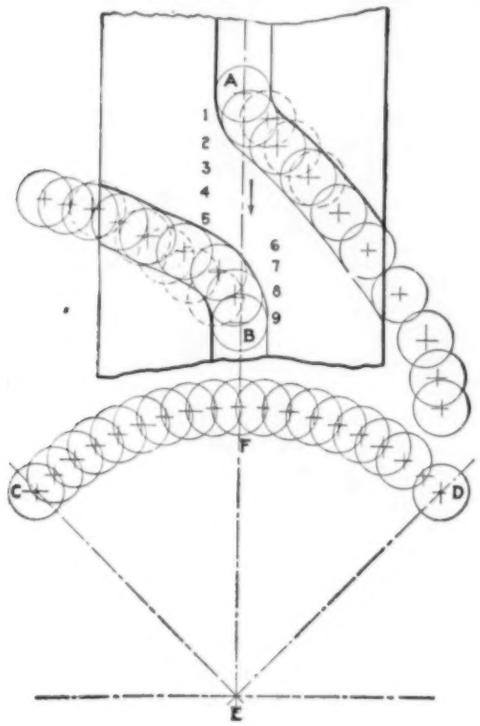


FIG. 2. LAYOUT OF THE CAM

allowed for the accurate adjustment of their relation to each other. A spline of ample size through the bore and a key which fitted fairly tight was responsible for the driving.

It was decided to allow 90 deg. of the cam's rotative movement to the indexing and the remainder of 270 deg. to the dwell, which was the actual operative, or productive, period of the machine. This decision was reached partly because tentative layouts of shorter indexing periods, when reduced to elements of time, "looked" too sudden, and principally because the old cams occupied about the same period in doing the work.

The work of cutting the cams was all done upon a heavy plain milling machine, which was provided with a very dependable vertical milling attachment and a good pair of indexing centers. Special tools made for the work were a $1\frac{3}{16}$-in. counterbore with removable pilot for taking out the stock, and a $1\frac{7}{8}$-in. center-cut end mill for finishing. A pair (right and left) of standard $\frac{3}{4}$-in. center-cut mills were also provided with which to remove the stock left by the counterbore.

Right here I would call attention to a point that is overlooked too frequently in the laying out of the barrel form of cam, and that is that in nine cases out of ten the follower, or roll, is mounted on a swinging lever, the natural consequence being that its line of travel is not parallel with the center line of the camshaft.

Besides its longitudinal travel the follower will have a movement in a direction transverse to the central plane of the cam, the magnitude of which movement corresponds to the versed sine of the greatest angle encompassed by the moving lever.

Let us take the case under discussion for an example. The cams were 10 in. in length and the radius of the roll lever (dial) was 10 in. The center of the lever was in a vertical plane midway of the length of the cam, thus the greatest angle reached was 30 deg., and the versed sine of 30 deg. to a radius of 10 is 1.3397.

In this case it was inadvisable, for reasons to be explained, to divide this transverse movement by swinging the roll below the central plane of the cam at the middle point of its travel and it therefore occupied at each end of the cam a position nearly $1\frac{1}{32}$ in. above the central plane, which not only materially affected the angle presented by the roll to the advancing face of the raceway, but affected also the depth of the latter, and particularly affected the movement imparted to the roll.

This circular path of the follower is usually taken into consideration in designing face cams because it is so easy to do it, but unfortunately it is usually ignored in the construction of barrel cams because of the difficulty involved in working it out.

A Necessary Detail

It is necessary in cutting this form of cam that the final cutting tool be of the same diameter as the working roll and that it move exactly in the same path in relation to the cam. The writer does not claim extensive experience with cams, but he has seen many in which this detail has been ignored and does not know of a cam-generating machine which provides for this movement of the cutter.

He once heard a machine designer, a man highly educated in mechanical matters and having a wide experience in the field of design, say that he "always made the rollers barrel shaped so that they would find their own bearing."

This was, in the writer's opinion, an acknowledgment of two things, one being that he (the designer) did not know how to design cams of this class, and the other that either all his cams were cut ten times as deep as necessary or that the bearing surface was only one-tenth of what it should be.

To provide for this deviation of the roller path from parallelism in cutting the cams under discussion, a heavy steel plate was made having one edge cut to an arc, the radius of which was equal to the radius of the indexing dial less one-half the diameter of the roll, or $9\frac{1}{16}$ in. This plate was clamped firmly to the face of the column of the milling machine with its curved edge projecting over the table when the work was set up.

A $1\frac{7}{8}$-in. roller mounted on a stud attached to the table completed this detail. The crossfeed screw was taken out and a weight, attached to the saddle of the machine by means of a cord running over a suitably placed sheave, served to hold the roller against the

guiding sector at all times; thus when the table was traversed the cutter would travel over the work in a circular arc corresponding exactly to the path of the working roll or follower.

The roll mounted on the table of the machine was made quite long (about 3 in.) to allow necessary vertical movement of the knee in drilling and counterboring.

The necessity previously mentioned for keeping the entire deviation of the path of the working roller from parallelism on one side of the central plane of the cam arose from the fact that by far the hardest worked points of the cam were at the corners where the curved paths joined the straight one—the starting and stopping points of the dials—where it was desired to have the roll at its maximum depth in the cam; and as these points were located midway of the length of the cam therefore the center line of the camshaft was made to lie in the same horizontal plane as the center of the working roller at its lowest point (this term "lowest" is of course in reference to the final working position of the cams and not to the set-up on the milling machine), and the sector and roller on the milling-machine table, in their relation to the center of the vertical spindle carrying the cuter, were so arranged as to bring about this coincidence.

Incoming and Outgoing Curves Differ

A moment's consideration of Fig. 1 will show that while the incoming roller moves downward *against* the direction of rotation of the cam the outgoing roller travels upward *with* this rotation, the total transverse movement, when considered as a trigonometrical function, being twice the versed sine of 30 deg. to a radius of 10 or $1.3397 \times 2 = 2.6794$ in., the result of this movement being that the curve at one end of the cam bears little resemblance to that at the other.

This is apparent in the development, Fig. 2, which shows the manner in which the new cams were plotted, this work being first done on the drawing board and then transferred to the surface of the cam blanks.

A portion of the cam surface was first drawn to scale on the drawing board and a distance equal to 90 deg. (the time allowed for indexing) laid off on the center line as *A*, *B*. This distance was divided into nine spaces, each representing 10 deg. of rotation.

Below the diagram and on the same center line was laid off the triangle *C*, *D*, *E*, representing a quadrant of the indexing dials with rollers at *C*, *F*, *D*. The arch *C*, *F* and *F*, *D* were each divided into nine spaces. With a radius equal to the dials arcs were drawn across the layout at each of the nine divisions—as 1, 2, 3, etc., in the sketch—and the corresponding points on the quadrant being projected up to them in the regular manner gave the locations (shown in dotted outline) of progressive steps of a uniform-motion curve.

As previously stated, however, this form of curve would have been entirely too harsh, owing to the weight of the parts to be moved, and an attempt was made to approximate a gravity-acceleration curve, though none of us had at that remote period ever heard of such a name being applied to a cam. This curve was effected by dividing the nine spaces geometrically; that is, the second step was made twice the distance of the first, the third twice that of the second, etc., up to the fifth step, and then decreasing in like manner to rest. The full lines show the result.

To transfer this layout to the cam surface an extension to the latter was practically necessary, and such extensions were fortunately to hand in the shape of two flat-faced pulleys 10 in. in diameter. One of these pulleys was slipped on each end of the arbor and lightly held with its setscrew, thus furnishing the surface which was required for laying out, and with no injury to the pulley. If the pulleys had not been handy, doubtless a block of wood would have served equally well.

Transferring the Layout

The outgoing curve was transferred to the cam surface from the drawing by the simple expedient of wrapping the latter around the blank and pricking the centers. A stud was then mounted upon the milling-machine table the center of which was in the same relation to the work as the center of the indexing dials on the machine undergoing repair bore to the finished cams.

This point of course fell beyond the table surface and the stud was therefore mounted upon a flat strap which was clamped to the table, projecting the required distance in front. As the steel sector governing the in-and-out movement of the table was located behind the table and presented a convex surface to its roller, a moment's reflection will show that a radius of 10 in. swung from a properly located point *in front* will follow exactly the same path in relation to the cam blank as will the center of the vertical spindle when the table is traversed with the guiding roller in contact with its sector.

Marking One Curve From the Other

On this stud was swung a sheet-metal sector representing one-eighth of an indexing dial, with headed bushings in the positions shown at *D* and *F*, Fig. 2. Fitted to these bushings were two accurately ground prick punches of drill rod, and by setting one of these punches successively in the marks already transferred and striking the other gently with a hammer, the incoming curve was laid out in true relation to the outgoing one without trouble or uncertainty.

Circles representing the diameter of the roller were struck from the centers thus obtained and the outlines of the raceway laid out to these by means of flexible templets. The rest of the work was merely a matter of removing metal to line with drill, counterbore and cutter.

All tools were fed down to a stop so that the depth of the raceway, while varying in relation to the curved surface of the cam, was always the same when measured from the plane of the working roll.

The removable pilot of the counterbore permitted going to full depth with this tool in two moves, thus avoiding an unsightly row of pilot holes at the bottom of the raceway.

The care taken in laying out and setting up the work was amply repaid by the result secured. Practically no hand work was necessary on the working faces of the raceways, which bore evenly upon the rollers throughout their length.

Before the repair was made each indexing movement could be heard and felt at any part of the room, while with the new cams the indexing was the quietest function of the machine.

The Riddle of Dependency—III

By CHESLA C. SHERLOCK

THE employer's liability for the payment of compensation to dependents is by no means fixed as it is in the case of payment to the injured workman himself. It varies according to the extent of the dependency at the time of the injury and death of the workman, and according to the relationship which such dependent sustained toward the decedent.

In point of degree there are two classifications of dependents, partial and total. These terms fairly well explain themselves.

A partial dependent is one who does not look to the deceased workman for entire support, but only for a portion of it, such portion varying in nearly every case that arises.

A total dependent is one who looks to another for entire maintenance and support, and the compensation usually awarded in such instances is the same amount which the injured workman himself would receive were he merely incapacitated and not killed. In other words, the law presumes that the basis of dependency in cases of total dependency is the extent of the workman's wages, or such portion as he himeslf would be entitled to under the law.

Degrees of Dependency

If a workman's widow who had been receiving the full amount of compensation as the only total dependent should die, would the award cease or not? If it did not, would it go to the workman's estate? If it went to partial dependents how would it be divided? These are all questions you may have to answer any time. The little summary of the series at the end of this article is worth remembering.

What Constitutes Dependency

There can be little room for discussion in regard to total dependency in America, for the reason that it is as well set out in the statutes as it is in case of the awards to be made to injured workmen. Total dependency is presumed in a number of instances in practically all of the statutes. These presumptions are final and cannot be overcome by any evidence which the employer can produce because they are "conclusive" presumptions. The only point about which there can be any contention is whether the claimant is really the party sustaining the relationship to the deceased workman such as would bring him or her within the statutory classification.

Upon a careful examination of all the statutes, we find that the first person to be conclusively presumed to be a total dependent upon the workman is the wife.

The language generally used is as follows:

1. The following persons shall be conclusively presumed to be wholly dependent for support upon a deceased employee:

(a) A wife upon a husband with whom she lives at the time of his death.

(b) A husband upon a wife with whom he lives at the time of her death.

(c) A child or children under the age of 18 years (or over said age, but physically and mentally incapacitated from earning) upon the parent with whom he is or they are living at the time of the death of such parent, there being no surviving dependent parent. In case there is more than one child thus dependent, the death benefit shall be divided equally among them.

This section is taken from the Massachusetts statute and is fairly representative of all of the statutes upon the subject. Careful examination has shown that the same identical provision is to be found in the following states, identical in effect, if not in actual wording: California, Connecticut, Illinois, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, Nevada, New Jersey, Ohio, Rhode Island, Wisconsin.

There is a slight difference noted in some of the states in regard to the age of minor children who shall be conclusively presumed to be wholly dependent. Many of the states place the age limit at 16 years rather than 18 years. It should be noted, however, that there is a presumption of the dependency of any minor child up until he becomes of age, but that over the 16- or 18-year limit mentioned in the statute, the presumption is not entirely destroyed as would seem, but is merely not a conclusive presumption.

Those who are conclusively presumed to be dependents are "total dependents" within the meaning of the law and the employer's liability to them in the way of compensation is practically the same as it was toward the injured workman, being governed by the same schedule. The right of persons to receive compensation as total dependents is a question of law and not a question of fact which might destroy their rights. If a wife or a husband or a minor child was living with him at the time of the injury, their claim is valid and they are total dependents, no matter how much of an income they might have had on the side, because the presumption is "conclusive" and cannot be rebutted by evidence.

There are instances, however, when the claim of these persons may rest entirely upon fact, but those facts do not hinge upon the main question but upon the questions raised by the wording of the statute. For instance, if a wife was not living with her husband at the time of his injury, then the employer may arm himself with that fact in resistance of the claim and defeat the claim. The matter is then a question of fact, as we found in the previous discussion.

Partial Dependency

Since dependents may be either wholly or partially dependent upon a workman for support, it is no defense to maintain that one is not a dependent because he is not entirely dependent upon another for support. Partial dependency may exist and give a right to compensation, though the contributions upon which it is based were irregular in amount and were made at very irregular intervals. And it makes no difference in cases of partial dependency whether the claimant had other means of support or not.

In a Connecticut case, it was shown that a father and mother were living with the deceased workman, their son, and that they owned considerable property in the form of a large farm. It was shown that the father was unable to work the farm and that he had

depended upon the son to do this. The son furnished all the money necessary for tools, supplies, clothing, groceries and the like and the father testified that he had depended upon the son for this portion of his support. It was held that the father and mother were partial dependents of the son and entitled to such compensation, regardless of the value of the property which they owned.

Typical Cases

Three New York cases have established the rule in that state to the effect that it is not necessary for the dependency to be total in order to entitle the claimant to compensation as a dependent; that partial dependency is sufficient to entitle a claimant to compensation, and that the fact that a workman's sister is only partially dependent upon him did not deprive her of the right to recover for his death.

In a Connecticut case, it was shown that for more than 10 years prior to his death, a workman had contributed one-half of his wages to his mother, who used the money in the support of herself and other children, although she did receive some support from her husband. The court held that the mother was a partial dependent of the workman.

In another Connecticut case where it was shown that the deceased had practically paid the house rent for his sister, given her money from time to time, and purchased coal for her, although her husband was earning $15 per week throughout the period, the court held that the sister had relied upon these contributions to her support and that she was entitled to compensation as a partial dependent.

In two other Connecticut cases, it was shown that the workman had contributed from $12 to $14 per month in the one case and $50 annually in the other case, in addition to board. The court held that those to whom the contributions were made were partial dependents and entitled to the minimum award of $5 per week for 312 weeks with $100 burial benefits in addition.

In a Kansas case, it was shown that the mother of the deceased was supported entirely by her husband, but that during the time immediately preceding the death of the son she had required medical and surgical attention for which purpose the wages of the deceased were always available to her. It was also shown that without this contribution she could not have had the medical attention she needed. The court held that she was partially dependent upon the deceased for support and sustained an award for this purpose.

The Massachusetts act, in all questions of dependency other than total, provides as follows:

"In all other cases questions of dependency, in whole or in part, shall be determined in accordance with the fact, as the fact may be at the time of the injury; and in such other cases, if there is more than one person wholly dependent, the death benefit shall be divided equally among them and persons partially dependent, if any, shall receive no part thereof, and if there is no one wholly dependent and more than one person partially dependent, the death benefit shall be divided among them according to the relative extent of their dependency."

It is observed where there are two classes of dependents claiming compensation that all of the compensation goes to those who are wholly or totally dependent upon the workman and is equally divided among them, the partial dependents having no rights whatever. However, if the partial dependents are the only ones in existence, they may claim compensation as dependents but they can recover only to the extent of their dependency upon the deceased, having no right to a *pro rata* division of the entire death benefit, as is the case in regard to total dependents.

This is one of the "riddles of dependency" which employers often misunderstand, but which is comparatively simple when considered in this light. The total dependents would, of course, be entitled to the entire compensation, but since the liability of the employer is limited to a certain amount, they must take their equal share of it; in the case of partial dependency, however, the dependents have no right to any more compensation than will compensate them for their share of the loss. Hence, they can recover only to the extent of their "dependency" upon the deceased workman.

The Connecticut act is identical with the Massachusetts act in this respect, except that it further provides that the amounts to be recovered by alien dependents shall be just one-half what they would have recovered had they been residents of this country, its dependencies or of Canada.

The Michigan act contains the same identical wording in regard to other dependents than those conclusively presumed and of partial dependents as the Massachusetts and Connecticut acts. However, it contains this additional provision: "No person shall be considered a dependent, unless a member of the family of the deceased employee, or bears to him the relation of husband or widow, or lineal descendant, or ancestor, or brother or sister."

In Minnesota, the statute speaking of partial dependents says: "Partial dependents shall be entitled to receive only that proportion of the benefits provided for actual dependents which the average amount of the wages regularly contributed by the deceased to such partial dependent at, and for a reasonable time immediately prior to the injury, bore to the total income of the dependent, during the same time."

The other American acts are practically identical in wording with the acts of Michigan, Massachusetts and Connecticut concerning the relative rights of total and partial dependents. In Rhode Island, however, the inference is that the partial dependents have no right to compensation so long as there are total dependents, but as soon as they die, then the remainder of the benefit may be claimed by the partial dependents according to the extent of their dependency.

It is not possible to bring this discussion to a conclusion without first mentioning what happens to the compensation upon the death of dependents. In case the award is made to the widow as a total dependent and she dies before the full benefit has been received, then such other dependents, particularly partial dependents, as there might be, have a right to the balance of the benefit according to the extent of their dependency. If there are more than one total dependents, and one dies, then the balance of the compensation, as paid to the deceased dependent is added to the compensation received by the surviving dependent.

If all the total dependents die, then the rights of the partial dependents may be asserted and they will be paid according to the extent of dependency. If one of the partial dependents dies, the survivors have no right to such additional compensation, unless the pro rata share awarded was not ample to really meet their loss, as where there is a large number of partial dependents

and the benefit or compensation is small and has to be prorated according to the extent of their dependency.

Where all dependents die, relatives have no right to the balance of the claim unless they were dependents in some way. The death benefit ordinarily is not deemed to have a survival value payable to the deceased workman's estate, although it does have that effect in some states.

We have found, then:

1. That any person who looks to another for support, either in whole or in part, for the necessities of life, is a dependent.

2. That dependency is based upon the actual contribution of money or service toward such support by the deceased at the time of his injury, and that such contribution was relied upon for that purpose by the claimant.

3. That the wife, husband, and minor child are conclusively presumed to be wholly dependent upon the deceased employee's earnings for support.

4. That the claims of all other persons for compensation as dependents must be determined by the fact as it existed at the time of the injury.

5. That dependency may be partial and does not have to be total in order to permit of recovery. That the degree of dependency determines the extent of recovery in all cases, whether total or partial.

6. That where there are more than one total dependents, the compensation is divided equally among them, while where there are more than one partial dependents, it is awarded according to the extent of dependency in each instance.

7. That total dependents have first claim on the compensation and can exclude all partial dependents so long as they live.

Johnson Increases Production

By John R. Godfrey

Johnson was wearing a sort of satisfied smile when I dropped in the other day. So I knew he was still out of the shadow of the bankruptcy courts and that his new plans must be working half way satisfactorily.

"It's working, Godfrey, old man," was his greeting, though I'm getting to the point where "old man" doesn't sound as chummy as it did when I was twenty or so. "It's working and, say, I'm having the time of my life. Never enjoyed running the shop half as much before. Just beginning to know what a really fine bunch of boys I've got when I get to know 'em. Of course, they aren't all angels, and there's one or two on my board of directors who might not pass muster if Gabriel was sorting out candidates for an angel's chorus.

"We're just beginning to be really acquainted and maybe I wasn't tickled the other night to overhear one of the old-time kickers telling his pal that the old man was sure playing the game square since he fired those bunco steerers of scientific Santa Claus fame.

"Just let me tell you what happened last month. Perhaps you remember those special gear boxes we made about five years ago, just before ex-Kaiser Bill took the lid off. Well, the same concern came back for another lot and wanted 'em in a hurry. Just remember labor is about double what it was then, and also that a lot of people are saying that men don't do as much as they did, either. Might have said that myself a few months ago—but not now, never—no more.

"In the old days I'd have turned the job over to the planning department and left it to them. This time I didn't. Called in the foremen and a couple of the best men from each department and we talked it over. We've learned a lot about machine work in five years, and then too we're just learning how to be honest with each other in the shop.

"I asked the boys to figure the labor costs very carefully, to make 'em as low as possible and not have to kill themselves to earn at least 25 per cent. over day wages; to figure on a basis of doing a good day's work with no fear of the rate being cut and that whatever they made on this job would not affect the price set on any other. What we wanted was production.

"I pointed out to them what that young firebrand had soaked into me, that if we could double the output of every machine, we were doubling our shop equipment without increasing anything but wages. Told them to figure labor, that I'd figure material and overhead, and if we could make a price to get the job, we'd split the net profit fifty-fifty, just to see how it worked. But I warned them that this might not be possible on all jobs.

"In about an hour they came back. And, say, Godfrey, in spite of the wage rate being higher, they gave me a piece price a little lower than five years ago. We got the contract and we're making good, too. The men are making good money; there isn't a sign of holding back for fear of a cut, and those machines of ours are earning more money for us than they ever did before.

"You just go out in the shop, Godfrey, and keep your eyes open. Better keep your mouth shut, too, for they won't want to bother to talk to you now that they are working for themselves. There's no warning of speedy boys to hold back and not kill the job, for every man knows that if he interferes with anyone else or anyone interferes with him, it cuts his wages and it cuts his profits.

"You'll find them all busy, you'll find the spoiled work is mighty small, and if you tried to hire any of the men to go to another shop, you'd have a hard job.

"Now, I'm not kidding myself that this solves all the problems, or that we're never going to have any differences of opinion. We're all still human, and none of us have even a sign of wings sprouting. Some of us are suspicious by nature and by training and we won't get over it this year or next.

"Then, too, I know just how much particular hell a bum foreman can raise in any shop, and I also know we haven't paid half the attention we should to getting the best men for the job. The foreman represents me in the eyes of the boys in the shop. If he's a low-down, grouchy cuss, they think he has to be to hold his job and they pass the blame along higher up.

"But we've got our foremen coming along too. We've fixed it so they come in on the fifty-fifty split in the profits and they're getting to be almost human along with the rest of us.

"We're getting over the notion that the man in the shop hasn't any brains or that he doesn't care about anything but quitting time and pay day. If he doesn't, it's our own fault—and if we can't keep him interested in the job, we aren't the managers we thought we were.

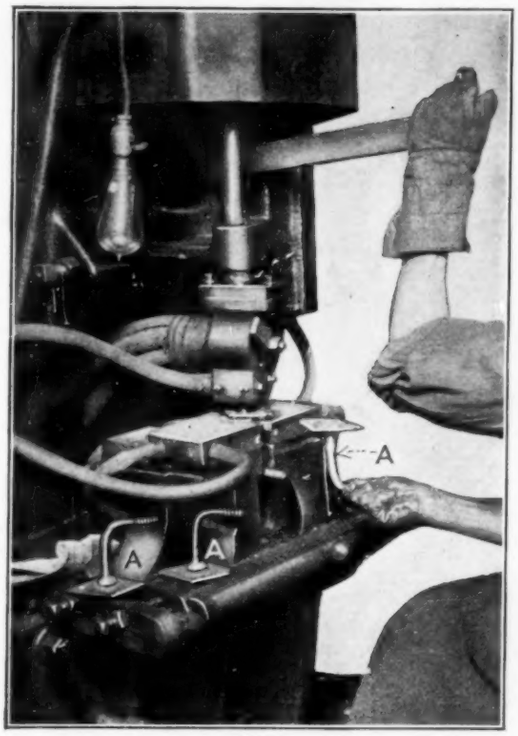
"It's like playing a new game and I'm having the time of my life. And this is only the beginning. I've got some other things up my sleeve that I'll tell you about when you come in next time."

Hot Riveting in a Press

BY JAMES MCINTYRE

Among a large variety of parts manufactured by the B. & K. Co. of New Britain, Conn., is the bracket shown in the illustration at *A*.

This bracket consists of a post and flange, and until the electric riveter was designed, the operation of joining them was accomplished by hand. The machine is a combination of butt-welder and punch press. The



HOT RIVETING IN A PUNCH PRESS

bent post which forms part of the work is first placed between the movable jaws of the holding device and is tightened by means of a wrench on the right-hand side. The pipes attached to the holding jaws carry a coolant to keep them from absorbing too much of the heat generated by the electrode which is brought in contact with the post after the flange is placed over the exposed end of the latter.

The electrode has a vertical movement that is controlled by the lever in the operator's left hand. After bringing it in contact with the end of the post the latter soon becomes red hot. The operator then swings the electrode, which turns upon a hinged joint, out of the way of the press ram.

Tripping the press brings a special-shaped riveting punch down upon the metal rendered plastic by the heat and forms a strong and uniform head. The speed of the operation is about 150 pieces per hour.

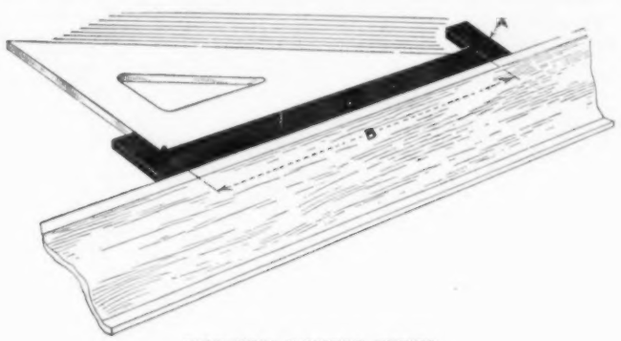
Section Lining Kink

BY E. L. CALDWELL

On page 848, Vol. 50, of *American Machinist* there is an article entitled "Section Lining Kink," by A. E. Kipps, in which I was interested.

In sectioning it is customary to leave most of the work to the tracer, just enough being placed on the drawing to show him what sectioning is required.

According to Mr. Kipps' method a draftsman must wait until a section line is fully dry before he will be able to move the triangle to the next position and even then it is not a very easy job to make the last-drawn



SECTION LINING KINK

section line and the line on the triangle coincide. A draftsman usually likes to work away from his work instead of over it.

For a number of years I have used the simple method shown in the sketch. *A* is a piece of maple or mahogany just a trifle thicker than the T-square and cut out as shown. The distance *B* is the length of the triangle plus the width of the required section line and one space. To operate the device, put the thumb of the left hand on the T-square to hold it in place, the first finger on the spacer *A* and the third and fourth fingers on the triangle and draw the first section line. Then move the spacer to the left with the first finger until it hits against the edge of the triangle, with the third and fourth fingers move the triangle to the left until it hits against the spacer and draw the second section line. Repeat until all the sectioning has been completed.

By this simple method a very rapid and accurate sectioning can be accomplished. Any number of spacers can be made in order to secure the different spacings desired, and to fit any size of triangle.

An Economical Forge Blower

By A. C. Delfield

The use of compressed air for blowing fires in drill sharpening and blacksmith shops, steel fabricating plants, car shops, shipyards, structural shops, bridge and building erection, etc., is common practice. In fact wherever compressed air is available its convenience generally leads to its use for this purpose. It has frequently escaped attention that it is extremely bad practice to compress air to 100 lb. pressure and then throttle it down to a fraction of an ounce, which is all that is necessary for blowing a fire if the necessary volume is supplied. This fact has lately been brought sharply to attention by the intensive shipbuilding program in this country which called for air plants of unusual size. The United States Shipping Board has investigated the subject thoroughly and in the published results issued by the Steel Ship Division it is stated as follows:

"The average air used by a rivet furnace runs from 20 to 40 cu.ft. per minute. The use of high pressure air in a great majority of shipyards is not only overtaxing the capacity of the air compressor plants in many cases, but is resulting in a waste of power that does not seem to have been generally appreciated. A large percentage of high pressure air now used for this purpose can be saved by the application of a jet syphon. The high pressure air passing through the nozzle of the syphon draws in a liberal quantity of free air which is mixed with the initial air. The percentage of induced free air taken in depends entirely on the design of the syphon blower, and runs from 30% in some of the crude arrangements which have been improvised by some of the shipyards to 75% or 80% for the best standard makes of syphons which have been carefully tested out by the Standard Practice Branch of the Emergency Fleet Corporation." (Since the above results were reported, the blower described in this article, Fig. 1, has exceeded 95% of free air induced, as shown by data below.)

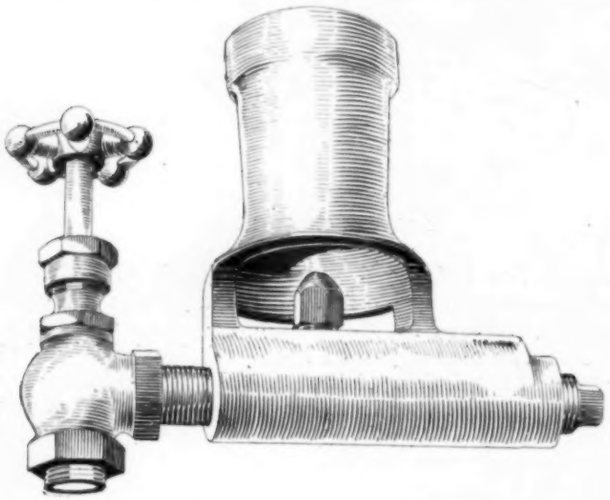


FIG. 1. SYPHON FORGE BLOWER AND NEEDLE VALVE

What a blower of this type means in dollars and cents is readily determined. The cost of compressed air per 1000 ft. ranges from four to ten cents, depending on the location and size of the plant, cost of power, etc. A fair average for a good sized plant is six cents per 1000 ft. This covers the coal or electricity purchased, labor, oil, supplies, etc. and fixed capital charges. A single small rivet-heating forge at an average of 30 ft. per minute, or 1800 ft. per hour, would use 14,400 ft. in eight hours and the cost at six cents per 1000 ft. would be 86.4 cents per eight-hour shift. In 25 working days of eight hours each, this would amount to $21.60 a month or $259 a year for one forge. Multiplying this by several hundred forges will give a very impressive total. The blower here described and illustrated will operate one of these forges on an average of 2 ft. of air per minute, or 960 ft. in eight hours at a cost of 5.76 cents a day, or $1.44 a month, a clear saving of over $20 a month per forge.

The construction of this blower as shown in Fig. 2 comprises a needle valve *V*, a jet chamber *C* with strainer *S*, a high-pressure jet nozzle *N*, with orifice proportioned to give a high velocity to the issuing compressed air, and a bell-mouth blast tube *B* to induce free air and transfer the kinetic energy of the small high-pressure jet to a large volume of air at a low pressure. The orifice of the high-pressure jet at its smallest section is $\frac{1}{16}$ in. in diameter. The volume flowing depends on the pressure admitted by the needle valve into the jet chamber. When starting a fire or bringing up a heat quickly, full pressure may be admitted, but in normal use the pressure acting on the jet needs to be only about 20 lb. or less. Tests on this blower give the following results:

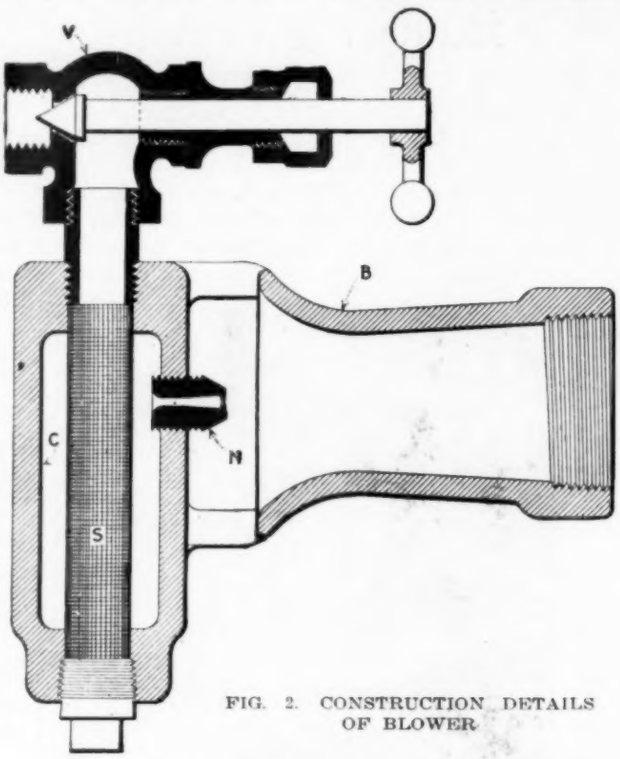


FIG. 2. CONSTRUCTION DETAILS OF BLOWER

Pressure in Jet Chamber *C*, Lb.	High Pressure Air Consumed, Cu.Ft. Free Air per Minute	Draft in In. of Water Pressure	Total Volume Air Delivered, Cu.Ft. per Minute	Ratio Air Delivered to Air Consumed
80	5.3	4.25	77.3	14.3
60	4.2	3.35	68.7	16.0
40	3.1	2.35	57.5	18.5
20	1.9	1.2	41.1	21.6

To secure this high economy the hole in the high-pressure jet must be small and properly formed, and all the proportions and arrangements of the blower worked out to the best advantage. A necessary feature is the strainer in the chamber *C* through which the high pressure air must pass before reaching the jet nozzle. This prevents the small jet orifice becoming choked with grit,

pipe scale or fragments of rubber from the air hose, which are always present in compressed-air lines.

The above data are obtained from tests on a "windbox" and not directly on a forge, as it is very difficult to get a measurement of the low-pressure air going to the forge. It is possible, however, to measure the amount of air used when it is all taken from the compressed-air line and a comparison can then be made on the same fire under the same conditions of fuel bed and draft, which will give a direct comparison of the two methods. A test of this kind was made on a small cast-iron rivet forge used in a shipyard. This forge has a grate 10 in. in diameter and the fire pot is of the usual flaring form about 12 in. inside diameter at the top. The thickness of fuel bed was 6 in. of pea coal. Air was first taken from the high-pressure air hose, no free air being induced, and the flow measured with an air meter.

Readings of the static draft in the ash pit under the grate were taken simultaneously with the meter readings. The blower was then connected and the needle valve adjusted so as to give the same draft readings as before. The difference between the high pressure used in this case and when blowing the fire direct without the blower, is a measure of the air induced by the blower under actual conditions of forge operation.

Draft in Ash Pit, In. of Water Pressure	Cu.Ft. Free Air per Minute Taken from High Pressure Line		Efficiency of Blower
	Without Blower	With Blower	
0.35	36.4	1.35	96.3%
0.7	52.4	2.52	95.2
1.35	59.3	4.76	92.0

It was noted that with 0.35 in. of draft there was a good slow fire, with 0.7 in. draft there was an active hot fire of rather greater intensity than the average required, and with 1.35 in. draft there was a very intense fire such as would be rarely required. As nearly as can be determined an average working condition would be 0.5 in. of draft, 45 cu.ft. free air per minute required without blower, 1.93 cu.ft. of high-pressure air required with blower, and efficiency of blower under this condition 96%; in other words only 4% of the necessary air for blowing the fire has to be drawn from the compressed air supply, the remaining 96% being induced from the free atmosphere.

Rig for Drilling Long, Small Holes

By John Drew

The piece shown at *A* in Fig. 1 is of brass, 2⅞ in. long, and requires the drilling of four 0.031-in. holes through it lengthwise at a slight angle to its axis. In order to have the holes come out within a reasonable distance of the desired point it is necessary to rotate both the work and the drill.

In the same figure may be seen the tools for holding and indexing the work, while in Fig. 2 is shown the set-up in the bench lathe.

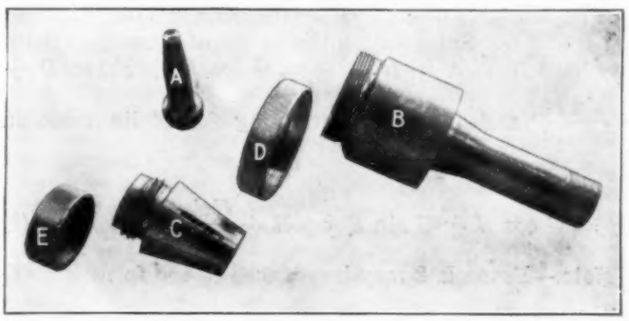


FIG. 1. THE WORK AND THE COLLET

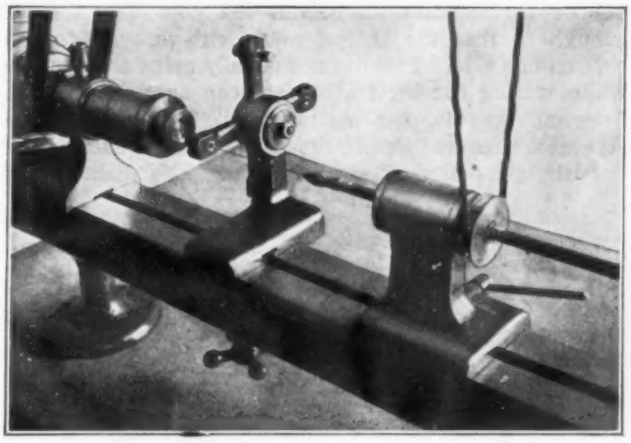


FIG. 2. THE SET-UP IN THE BENCH LATHE

The collet *B*, Fig. 1, is held in the spindle of the lathe by the drawrod in the usual manner. The large end of this collet is bored out to fit the part *C* which is held in place by the ring nut *D*. The axis of this taper bore is at an angle to the axis upon which the collet runs corresponding to the variation from parallelism of the holes in the work.

Four notches in the periphery of the cone-shaped plug *C* provide the necessary settings for drilling the holes. A thumb-operated latch in the body of the collet holds the plug from turning and renders the indexing movement quick and convenient of accomplishment. The ring nut *D* bottoms against a shoulder to leave part *C* free to turn when unlatched but does not allow it to move endwise.

The work passes through an axial hole in *C*, the shoulder being tightly clamped against the end of the plug by the ring nut *E*.

A special foot stock is used on the bench lathe as shown in Fig. 2 to drive the drill. A sleeve mounted on ball bearings and carrying a small grooved pulley is driven by means of a round belt from an overhead drum. A center rest carries a bushing which guides the drill almost to the point of contact with the work.

Before starting the drill, however, the arm of the center rest (shown upright in the picture) is swung down to a horizontal position where it latches, and the work is spotted with a small centering, or spotting drill carried in this arm.

Upon completion of one hole it is only necessary to press the thumb upon the latch in the collet, turn the conical plug one-quarter turn, and proceed with the drilling.

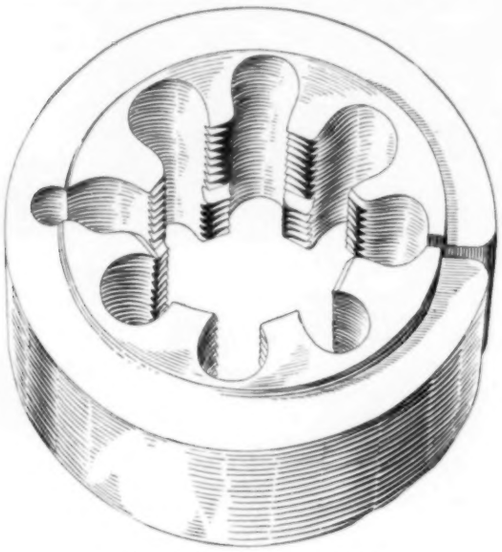
A Special-Purpose Screw-Cutting Die

By Alonzo G. Collins

In rummaging around among some of my belongings the other day, I ran across a screw-cutting die which I think is unique as well as antique. It is the only one of the kind I have ever seen and it is new to every one to whom I have shown it.

A good many years ago a concern by whom I was employed took on a contract for several thousand cast-iron screws, ⅞ in. in diameter, and 2 or 2½ in. long in the threaded portion. The castings were cored out to a diameter that did not leave much metal below the root

of the thread, and sometimes the core would shift enough so that the thread would cut through to the core on one side. This did not usually make any trouble while cutting the thread, but as soon as we started to back off the die, the casting would crush, and considerable time was lost in digging the fragments out of the die, thus hindering production. The diameter of



A UNIQUE THREADING DIE

the core could not be reduced, as it formed a receptacle for a coiled spring which was part of the mechanism.

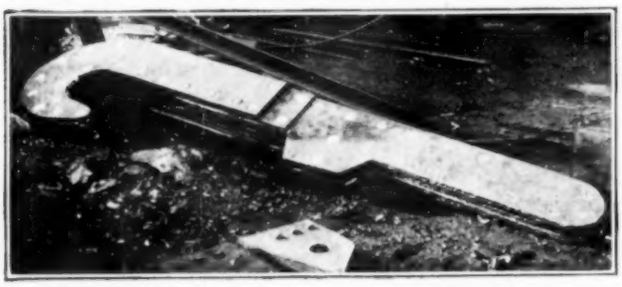
Various remedies were discussed and tried, until it was suggested that the cutting through of one side allowed the remaining metal to spring out, when the die being made to cut in one direction only would bind and crush the shell which was too weak to stand up under the pressure. This suggested a way out by making a die which would cut in either direction. This die, shown in the sketch, proved a perfect success; so much so, that it was not uncommon to make a perfect cut, with nearly one-half of the circumference of the thread cut through.

Large Steel Ladle Hook Made From Scrap Ship Plate

BY CHARLES C. PHELPS

As an instance of the many savings that may be obtained by the intelligent use of the gas-torch cutting process, the following will be of interest:

At one of the shipyards scrap ship plates are cut into special shapes for building up large hooks. These hooks are used for handling large ladles in a nearby steel mill and have resulted in a great saving.



STEEL LADLE HOOK MADE FROM SHIP PLATES CUT WITH AN OXWELD GAS TORCH

The hooks are 8 ft. in total length and are made up of six layers of plates which run the full length, and four short layers, all securely held together with countersunk rivets. The four inner plates are each $\frac{1}{2}$ in. in thickness. The two outer full-length plate are of $\frac{7}{8}$-in. material. Adjoining the latter plates on either side is a half-length plate $\frac{1}{2}$ in. in thickness. The hook proper is still further reinforced by two slightly shorter outer plates, each $\frac{7}{8}$ in. in thickness.

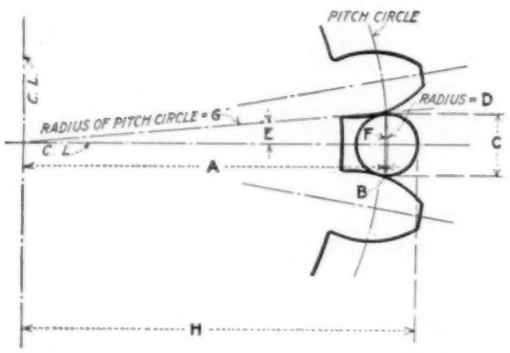
The plates are first marked with the aid of a templet to serve as a guide for the oxygen cutting blowpipe. After cutting, they are assembled and riveted as shown in the illustration. A laminated construction of this sort is not only exceptionally strong, but is a decided economy, as it makes use of what would otherwise be waste material.

Formulas For Gear Plug Gage

BY C. H. DENGLER

A good way to test the accuracy of gear teeth is to use a plug gage, which should fit between perfectly cut teeth to a given depth or radial distance from the gear center.

After some trouble had been experienced in working out the proper dimensions of such a gage for the tool-



PLUGGAGE APPLIED TO GEAR TEETH

maker it occurred to me that a general formula for the solution would save time.

A reference to the figure will show that the angle $E = \frac{360^\circ}{4(\text{No. of teeth})}$. Then $A = G \cos E$, $B = F \tan E$, $F = G \sin E$, and $D = \frac{F}{\cos E}$, where G = pitch radius.

The diameter of the plug C is $2D = \frac{2F}{\cos E} = \frac{2G \sin E}{\cos E}$ (1)

The center distance H is the sum of the distance A, B and D. Substituting the values of these quantities we have $H = A + B + D = G \cos E + F \tan E + \frac{G \sin E}{\cos E}$, and further substituting for F its value in terms of G and E is

$$H = G \cos E + G \sin E \tan E + \frac{G \sin E}{\cos E} \qquad (2)$$

[Note.—Formula 2 may be reduced to the form $H = G\left[\frac{1 + \sin E}{\cos E}\right]$ —ED.]

How the Business Press Serves Industry*

By A. C. PEARSON
President, Business Publishers' Association

The business publication is made possible by the coöperation and support of its industry, but it likewise in turn makes possible the more rapid growth of that industry. Experts on world commerce have stated that they could tell the progress of a nation in any line by inspecting its business papers in that particular line, and any country wishing to progress in a particular industry might well invest a large sum in the improvement of its publications in that particular industry.

THE publications of the business press may be divided into two general groups; namely, trade papers and technical papers. The trade papers are those which have to do with merchandising and which reach either the manufacturer or the distributor of merchandise, and the technical papers, such as engineering publications, are those which devote themselves to one particular science or profession.

The outstanding features of a business paper is that it confines itself to business subjects and handles only those subjects which apply to its own trade or industry. The subscribers to business papers are interested in both the editorials and advertisements since they take these publications for the serious purpose of getting information and assistance in their particular occupation and because all the contents bear directly on their business or profession.

The fact that the United States has made great industrial progress in the face of high wages as compared with other countries is due, first, to the ingenuity of its inventors and managers, and, second, to the modern methods of distribution made possible by the editorial and advertising services of its business papers.

Regardless of the great territorial extent of the United States, there is a similarity in the business methods and the kind of merchandise required in all the different states because of the quick dissemination of information through business papers. This same connection can gradually be established throughout all the Americas.

To get a commercial understanding and to promote the interchange of trade, it is necessary to read the same publications and adopt the same general business practices. It is most encouraging, therefore, that large numbers of the leading business papers in the United States are producing foreign editions and that many leading Latin-American publications are getting editorial information and extensive advertising from the United States.

The business paper's first service to commercial intelligence is in its news of the markets, of the merchandise developments of the trade, or of the scientific progress. Its second service is that of advice and criticism. One prominent trade publication has as its motto, "What to buy and how to sell it." It devotes as much time and attention to the subject of selling merchandise as it does to the markets, the changes of which will affect the price or desirability of merchandise.

A third great service rendered by the business publication is the advertising which it brings to the subscriber. In this is included the best offerings in the briefest possible form of the merits and talking points of the merchandise which that particular subscriber is interested in. There is so much supervision of copy and method by the publishers that in the business-paper field today the advertising renders a service which is closely second to the editorial.

The leading business papers go into all the problems and the needs of their industries. They are the leading agitators for progress and frequently the unsparing critics of trade abuses. Many of these business papers conduct information departments which personally aid their subscribers in handling their problems of accounting, store or factory systems, credits, and even coöperate with them in choosing the proper merchandise for specific uses or particular locations. They take a leadership in advocating necessary legislation for the improvement of industry, and are leaders in all broad, helpful and patriotic movements.

For example, the "Made in U. S. A." campaign was originated by a business paper. The great prosperity campaign now running is the result of the coöperation between some leading business men and business papers. The present Webb-Pomerene bill, which promises so much for foreign trade in the United States, was made possible largely by the coöperation and agitation of the business press. The fact that the United States Government secured its advertising free during the war, instead of paying out millions of dollars to publications, was due to the fact that three hundred business papers came forward and volunteered their space without charge to the Government for the duration of the war. The other papers rapidly came into line, but the leadership rested with the business press. In one Liberty Loan campaign there was given by the business press of America more than 4000 pages of free advertising to the Government. In recruiting men for the Signal Corps, Aviation Corps and other important technical branches of the service the business papers took a leadership which brought them the unstinted praise of Government officials.

These few illustrations are given merely to show the responsibility of leadership which the business press takes.

With this understanding of the business press it may readily be seen why it is giving so much attention and rendering so extensive a service in promoting, not only the foreign trade of the United States, but also the interchange of products between all foreign countries and our own.

Since efficient service is based first on proper information, it will be necessary that the business papers make a thorough study of foreign conditions and that they equip themselves to show editorially the changing market requirements of the different countries to which their manufacturers wish to appeal. This rule applies to the Latin-American publications in the same way that it applies to those of the United States. There might well be close connections established between leading Latin-American business papers and those of our own country.

The activity of our publications in reaching the Latin-American field cannot be judged merely by those which carry Spanish names, as a large number of our other publications are seeking foreign subscriptions and some of them publish special issues which are printed in Spanish as well as English.

The success of the trade between this and other countries will depend on the knowledge we have of the markets and requirements of our customers, wherever they may be. This information can be given primarily by the business press, and there is every indication that these publications are thoroughly alive to the responsibility which they owe their industry as well as their country.

*An address delivered before the Pan-American Commercial Conference, Washington, D. C., June 6, 1919.

Apprentices Here and in Europe

By E. J. S. Halvorsen

To those who have still to learn that to become a tradesman today in the United States involves but a small fraction of time, energy and adaptability compared with what is required in almost all of the European countries—France, England, Switzerland, Scandinavia—to obtain what is regarded as the degree of a journeyman mechanic, this article may be of interest.

There may be instances where the time of apprenticeship abroad would seem somewhat too long, as for instance in England, where a boy has to serve five years in order to become a machinist, but there can be no doubt that a few extra years, before he considers himself a full-fledged mechanic and entitled to a skilled workman's wages, would do the individual youngster no harm.

To better illustrate the different conditions it will perhaps be well to give a few examples from abroad of the way in which the young folks' lives are laid out for them until they are able to take care of themselves. In the building trade, for instance, a carpenter's apprentice must serve at least four years; he must begin at the very bottom, possibly even by keeping the shop clean as one of his duties; he must learn to use a saw correctly, likewise a plane, chisel and other carpenter's tools, and get acquainted with the different kinds and grades of wood. He is most certainly not set to the making of stairways, doors, windows or other advanced work.

Take a mason or bricklayer which, by the way, in Europe is all one—a mason being also a bricklayer, a plasterer, a concrete worker, and everything else connected with lime, sand, cement, bricks and stone. He cannot expect to start in the first thing building a chimney or doing similar difficult work; he must come to this by degrees; get the fundamentals first; acquaint himself with lime, sand, bricks, etc.; with the right way of mixing mortar; get the correct swing of his trowel, and many additional details which must be shown him and practiced by him until mastered. We all have to creep before we can walk; this is true as well with a profession.

A boy who aspires to be a machinist must first learn the use of a file—the most difficult part of the machinist's trade and one very much neglected—he must learn how to grind and temper drills, tools, etc., and it never does him any harm to get acquainted with the blacksmith's trade. Most people today think that being a machinist means being able to run a lathe, when in reality the lathe is to be considered only as a mechanical assistant to the mechanic, though many a man working in a machine shop thinks he is some machinist because he is able to run one.

Take plumbing, one of the most abused of trades. Anyone, seemingly, can become a plumber's helper, and I believe one year as a helper makes one a journeyman while in another year the neophyte has become a master plumber. To be able to do a good job of plumbing, starting with the sewer connection and ending above the roof, one must know his business; know how to handle the different kinds and sizes of cast iron, wrought iron, lead and brass piping; how to sweat a joint, and to carry the piping through the roof in a neat, water tight and presentable manner.

Patternmaking is practically the only real trade in America where apprenticeship is considered necessary, and this exception is for the simple reason that one cannot possibly become a patternmaker through the work of one's hands alone. Shrinkage of different metals, fitting of cores (or prints), coreboxes—more or less complicated—and many other details must be taken into consideration.

In Europe, in all trades the apprentice is carried along in his work from ignorance to good practical knowledge and skill, and during his years of learning he is under strict contract with his employer whose duty it is to see that he learns his trade as well as possible and further that he attends evening trade school from four to five evenings weekly for a good part of the year, where he is taught free-hand drawing and sketching, geometrical drawing, trade drawing, architectural, mechanical, perspective and art drawing.

It should not, however, be forgotten that these years of apprenticeship in the above-mentioned countries are trying years financially for the young man, for but a few get anything at all in their first year (some nothing at all for all four years) and not much above pin-money the following years. When a lad starts to learn a trade in America he often receives a European workman's pay from the start and this salary demand often creates a bad feeling among older workers, which feeling, peculiarly enough, is seldom directed upon the youngster himself but rather upon his employer.

It might well be said that the quick and accurate interpretation of working drawings, blueprints, etc. is something which far too many mechanics still neglect and seemingly care little about; in fact, they do not seem to regard it as necessary knowledge, though such knowledge may be as vital as the building of machinery, or the making of patterns.

A carpenter in European countries has (or had until very recently) the distinction that he used no nails to build a frame house (staging excepted) outside of lathing; in this country a few kegs of nails to a frame are as necessary as a roof.

The American apprentice might as well be sent off without further ado after his time is finished, but such is not the practice on the other side. A few weeks prior to the close of the boy's term, he must prepare to perform a certain piece of work as a sort of proof of the ability he has attained during his apprenticeship. He may choose what he desires to make, within certain limits, but as soon as he has made this decision he must make his drawings, generally in a technical school room where he is under surveillance but receives no assistance whatever. He must make short work of his design and details, as well as the actual work, which will generally be made in another shop than the one in which he has served and will be judged by master workmen other than the one who has taught him.

His immediate income thereafter depends largely upon how well he has succeeded in this work, and should he fail altogether he must serve another three to six months and go through the same trial again at the end of that time.

This may seem to the American people a more or less extravagant precaution, but over there the document received from the aforementioned judges is the apprentice's passport to his particular branch of the trade union, and without which no one can become a union man. Neither are the higher educational institutions, colleges, etc., for architects, landscape architects, mechanical engineers and other professions, open to the would-be student unless he can prove at least three years' apprenticeship.

Would it not be possible, I wonder, to adopt a little of the European idea in this country to give a broader scope and a greater thoroughness to the bringing up of boys and young men who want to become skilled workers? I feel sure that the employer would not be a loser, but would on the contrary benefit himself as well as the trade in general.

Mounts for Naval Anti-Aircraft Guns

I. The Carriage and Ball Races

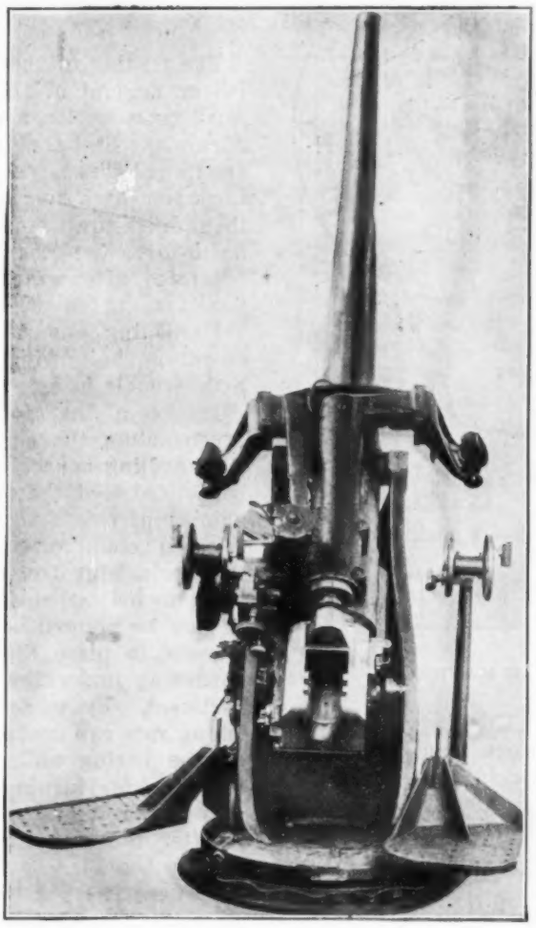
By FRED H. COLVIN
Principal Associate Editor *American Machinist*

Here is a combination of heavy work and close limits which required considerable ingenuity. Horse sense, experience and hustle are the trio which has made good in this shop. Many of the methods can be applied to other classes of machine work.

THE transformation from peace to war brought many changes to our machine shops, and has shown perhaps better than anything else the way in which the leaders of our machine industry can meet any emergency that might arise. The making of these mounts for naval anti-aircraft guns entails many intricate problems, and yet, starting from a vacant shop building in February, 1918, the Russell Motor Car Co., Buffalo, N. Y., had its first mount ready for testing in five months. Results like this can be obtained only by complete coöperation.

The general appearance of the gun mount is shown in the headpiece, and as it is a 3-in. gun the size of the mount may be appreciated. The size of the parts and the accuracy required make it an especially interesting piece of work, and the way in which some of the details were carried out should be of assistance to those employed in other lines of machine work.

The main part of the anti-aircraft gun mount is designated as the carriage, although in machine-shop parlance it would be called a pedestal. This is about 6 ft. high, 36 in. in diameter at the outside of the flange and weighs about 1 ton. It is an awkward piece to handle, and on this account the methods used are worth while explaining. The first operation is to slot, or face, the sides of the yoke which forms the trunnion bearing, this being done on an ordinary slotting machine while the carriage is suspended by the outer end from an overhead hoist. Next comes the laying out of the trunnions on a surface plate so as to show the man milling these bearings where to cut. Fig. 1 shows how they are milled, the way in which the cap is held in place at each end and the manner of holding the work.



Perhaps the most remarkable operation on the carriage is turning the base for the ball-bearing rings on which it revolves, shown in Fig. 2. The base must be turned on both sides, and as a ball race is fitted both top and bottom it is necessary to remove considerable metal, as may be judged from the fact that about 500 lb. of steel casting are turned from each base. This means high speed and deep cuts, the bases having been finished in 13 hours, or the removal of about 40 lb. of metal per hour. Although this is a large casting and is stiff enough to perform all its functions in supporting the 3-in. anti-aircraft gun which it carries it was found that under heavy cuts taken there was an opportunity for twisting, and in order to prevent this the mandrel shown in Fig. 3 was designed and built. This not only supports the heavy casting in the lathe centers but also drives it at the flange end, effectually eliminating any twisting in the casting itself.

The upper end of the carriage is held on the faceplate *A* by means of the setscrews *B*. These locate the jaws in their proper position, while the straps *C* prevent endwise motion. The mandrel *D* extends through the casting and carries the chuck *E* at the other end to support the base end and to drive it at this point. The setscrews *F* hold this chuck to the bar, while the bolts *G* force the three jaws *H* into contact with the casting and both center it and drive it for the heavy cuts taken.

The capscrew holes for the trunnion bearings are next drilled and tapped, as in Fig. 4, and the carriage then goes to a special fixture, or cradle, shown in Fig. 5, which supports it while the trunnion bearings are being bored and faced. This lathe is used for nothing else, so that it is always in readiness, and there is no question about the fixture being properly aligned. It will be seen that this fixture extends behind the lathe bed proper, and the next view, Fig. 6, shows how it is supported on the end of another lathe that is only used at its head end for boring and threading the adjusting nut for the ball bearings. Both of these lathes were secured with a view of combining them in this way, which indicates how a little careful planning can overcome unusual problems without undue expense.

Another uncommon fixture of the cradle type is used under a large radial drilling machine for drilling the various holes on the side of the carriage. It is only necessary to load the carriage on the large rollers of the fixture and to swing the arm to bring the drill into the proper position.

The gun carriage is mounted on a stand which carries the lower ball race. A portion of this is shown on the boring mill in Fig. 7. The worm ring, or training circle, is turned on the outside and threaded on a 42-in.

Bullard boring mill. The wormwheel is then hobbed on the Goss hobbing machine shown in Fig. 8.

The inner ring carries a bronze liner which bears on the inside of the carriage, or pedestal, at its base, one of these rings being shown on the boring mill in Fig. 9. This ring has a bronze liner shrunk on the outside and one of these rings is shown in place on the gas-heating ring at the left of the boring mill. These bronze rings are turned up double and cut in two.

The inner ring is then turned to the proper size and the boring mill stopped while the ring is being

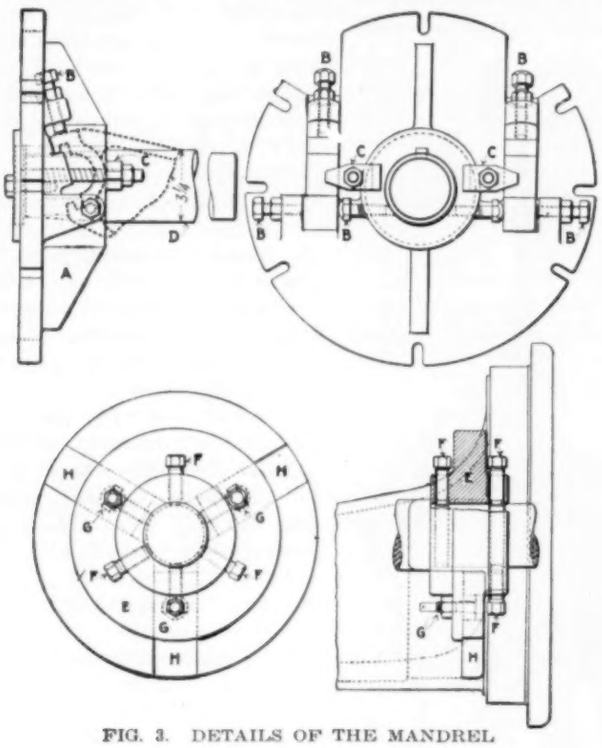


FIG. 3. DETAILS OF THE MANDREL

heated in the furnace shown. This is very quickly done, frequently not requiring more than one minute, after which it is lifted from the furnace and put in place over the inner ring. It cools almost immediately, so that the boring mill can be started and the bronze liner turned to its correct size with almost no loss of time.

The Elevating-Arc Bracket

The elevating arc is fastened to the arc bracket, which in turn bolts to the slide, as before mentioned. The arc brackets are turned in pairs on a special boring-mill fixture as shown in Fig. 10. They are of course first planed to fit both the slide and the fixture, and are then ready to receive the elevating arcs themselves, as can be seen in the assembled view.

The elevating arc is a rather difficult portion of the gun mount. The arcs are turned on a boring mill, three being placed on a table at one setting and, in addition to being turned on the outside, bored on the inside to fit the arc brackets, and a T-slot is turned in the outside to receive the adjusting piece which fits in it. This is a delicate piece of boring-mill work on account of the depth of the T-slot and the accuracy required. These slots are turned to gage, and the adjusting segments are fitted to them after being turned as accurately as possible.

Some idea of this fitting can be gained from Fig. 11, which shows how the arc is held in a vise while the adjusting piece is being fitted to it. This requires considerable scraping, as it must be a good, light driving fit, as the center piece is to provide adjustment for wear in the arc teeth. Adjustment is obtained by means of wedges not shown. This arc resists the tendency of the recoil to rotate the gun around the trunnions on the slide so that it must be a good fit in the pinion by which it is moved.

After these adjusting pieces are fitted into the arcs they are taken to the gear-cutting machine, Fig. 12, and three of them mounted on the faceplate as shown. They are then cut in the regular way and the surplus metal at the end of the arcs is removed by a milling saw.

Ball Races

The making of the ball races is a somewhat difficult job on account of their large diameter, comparatively small cross-section and the tendency of steel to spring during the heat-treatment or after it. These ball races are forged double without being welded, are then rough-turned on each side and carefully annealed. They are then finish-turned on one side. The next operation finish-turns the other side and the two rings are then separated, after which the unfinished sides receive their final turning operation.

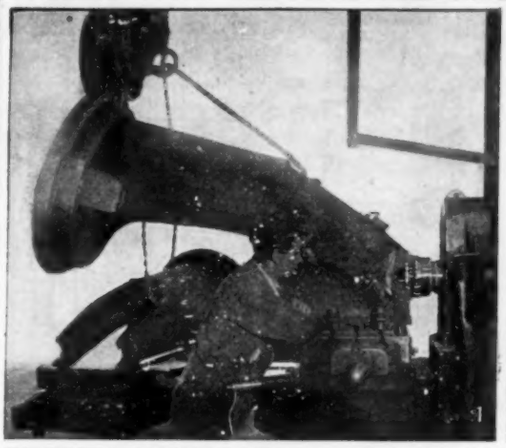
Hardening and tempering comes next, a delicate operation, but owing to the apparatus provided very little trouble is experienced. Fig. 13 shows the hardening room, the cooling tanks and the special tongs for handling the rings without distortion; details of the handling apparatus are shown in Fig. 14. It will be noticed that the rings are carefully supported at a number of points and that these supporting hooks are released simultaneously so as to avoid any undue stresses arising from even momentary unequal cooling.

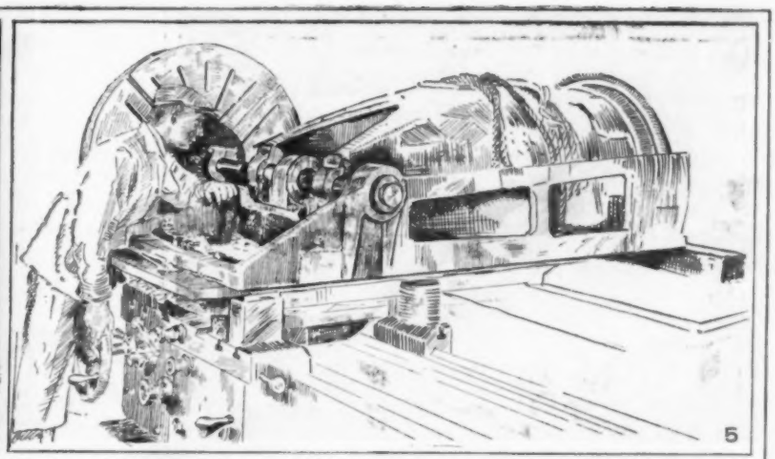
As an indication of the delicacy of these large rings it may be pointed out that it has been found advantageous to place the machining of the races before hardening under the supervision of the grinding department. By so doing those responsible for the finishing race can control the way in which it is clamped on the boring mill, as an undue stress imposed in clamping for turning tends to throw the race out of shape after it has been hardened and ground.

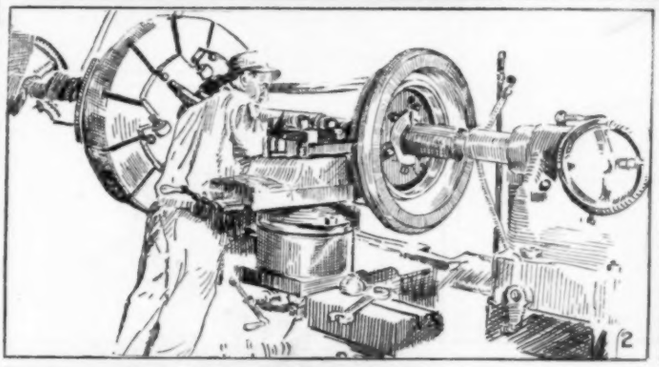
After the race comes from the hardening room it goes to the Blanchard vertical grinding machine, Fig. 15, where it is held on the magnetic chuck while the sides are ground flat, after which it goes to the special grinding machines shown in Fig. 16. These are also provided with magnetic chucks on which it is necessary to center the ball races carefully by means of a dial gage used on the inside of the ring. When the race is accurately centered both the inside and outside diameters are ground by the plain wheel shown at the left, the magnets which hold the ball race being raised sufficiently from the surface of the faceplate to enable the wheel to pass the ring inside and outside.

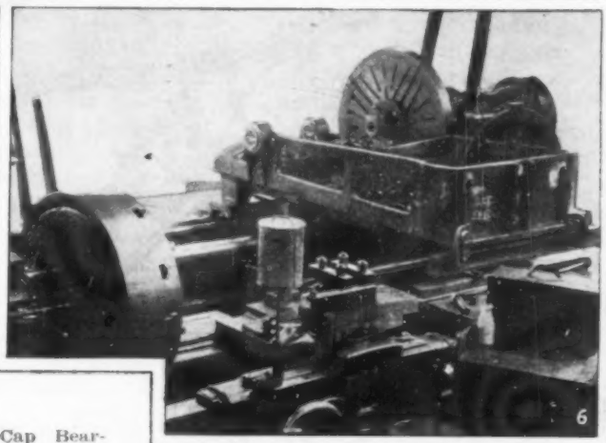
The grinding of the ball seat is accomplished by a formed wheel shown at the right, this being located at the proper distance from the center and kept in condition by the diamond truing device of the proper radius which can be applied as often as necessary to maintain the ball seat at its proper radius. Even though this is a large ball race the tolerence is only 0.0015 inch.

After the ball seat has been finished the race goes to another special grinding machine, Fig. 17, which









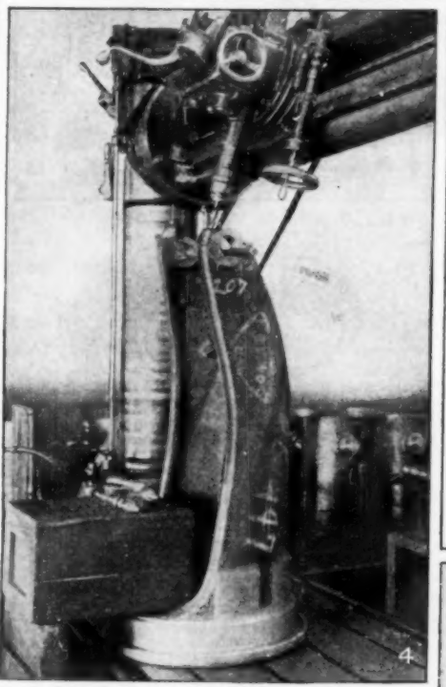


Fig. 1. Milling Cap Bearings.

Fig. 2. Turning for Ball Races.

Fig. 4. Drilling for Cap-screws.

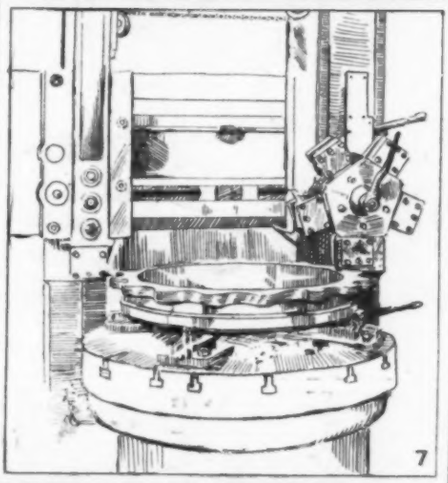
Fig. 5. Facing Trunnion Bearings.

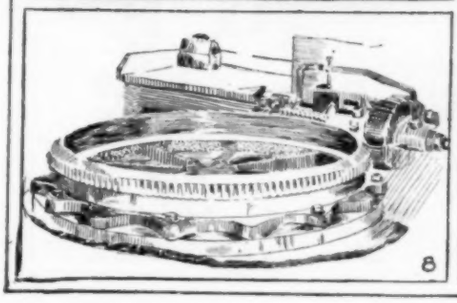
Fig. 6. Two Lathes Utilized for One Job.

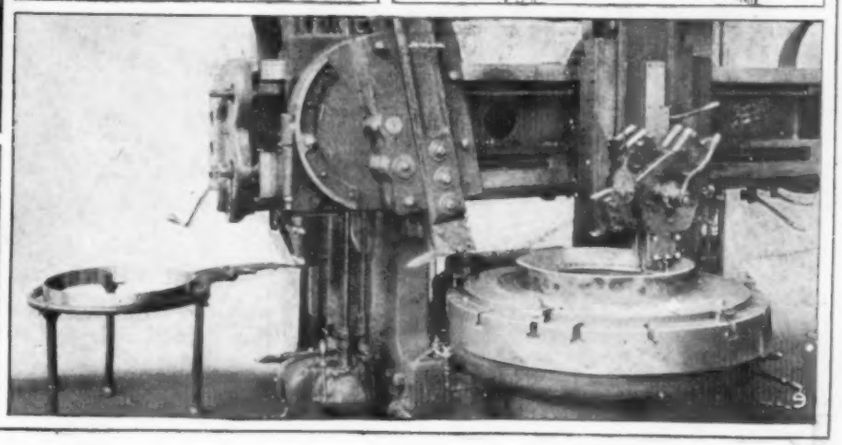
Fig. 7. Boring the Carriage Stand.

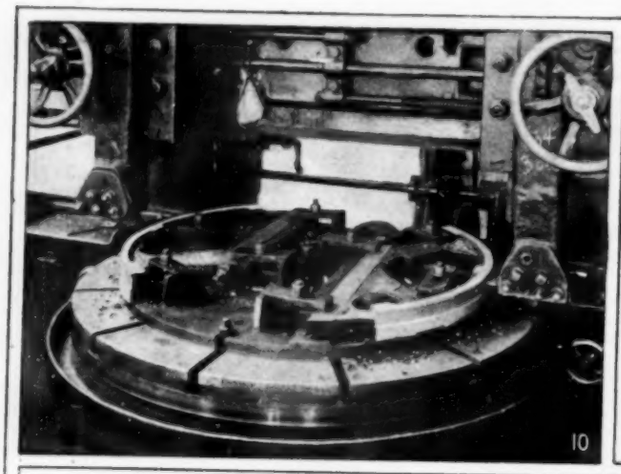
Fig. 8. Cutting the Worm Gear.

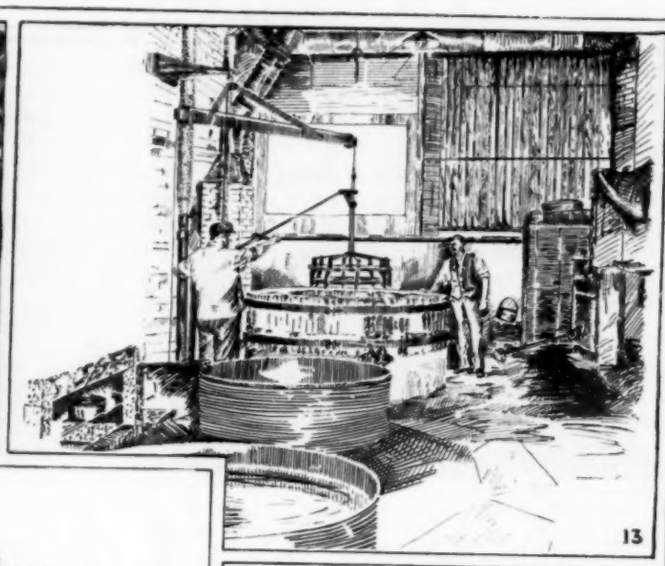
Fig. 9. Fitting on the Bronze Liner.

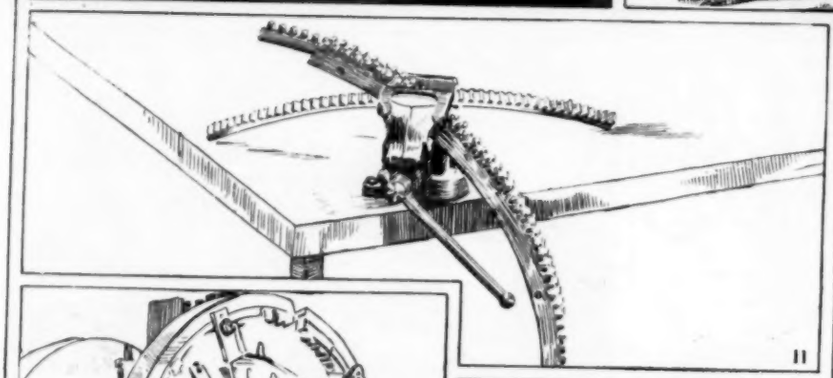


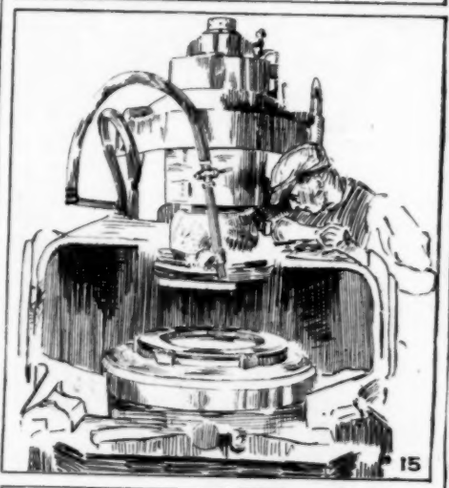












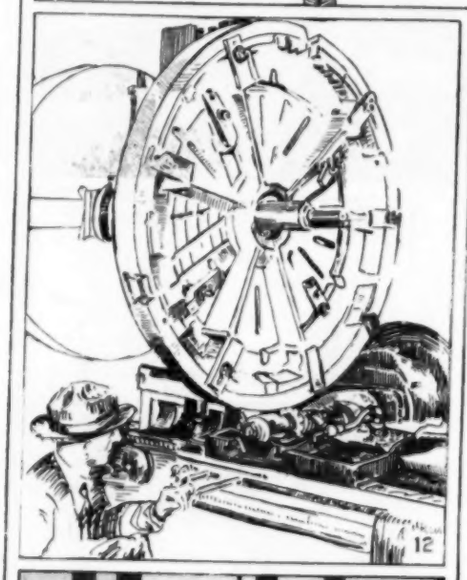


Fig. 10. Turning the Arc Brackets.

Fig. 11. Fitting the Adjusting Segment.

Fig. 12. Cutting Teeth in the Adjusting Segment.

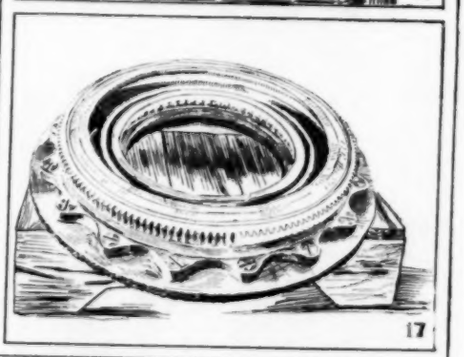
Fig. 13. Hardening the Rings.

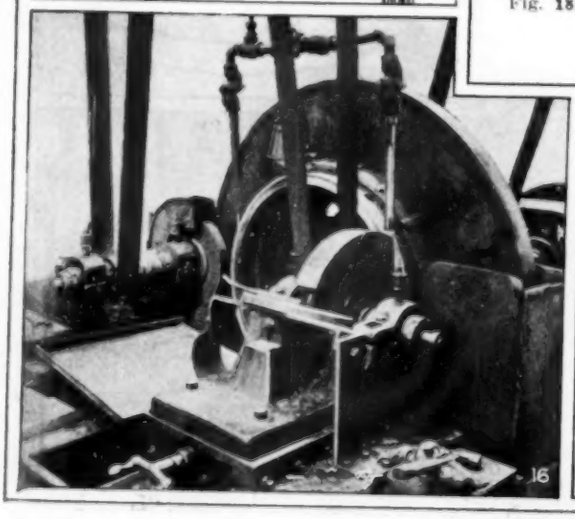
Fig. 15. Grinding sides of Ball Rings.

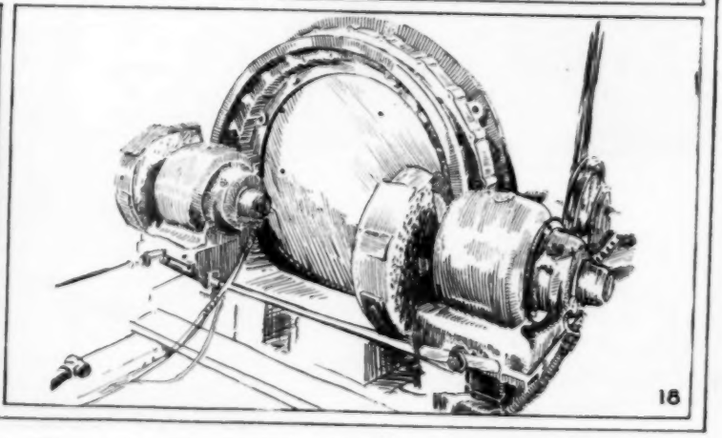
Fig. 16. Grinding the Ball Races.

Fig. 17. Grinding the Chamfer on Edges.

Fig. 18. The Assembled Ball Bearing.







produces the desired radial chamfer on the edges of the ring, allowing the ball race to seat properly either in the gun carriage or the base ring or stand as the case may be. This radius is not required to be unduly accurate, as it must simply clear the metal in the corners of the recess to allow the ball race to seat firmly in the carriage, the stand or the adjoining nut, whichever it might be.

The method of obtaining the desired radius is of interest because of its simplicity, the means by which it is automatically secured being clearly shown by the illustration of the machine itself.

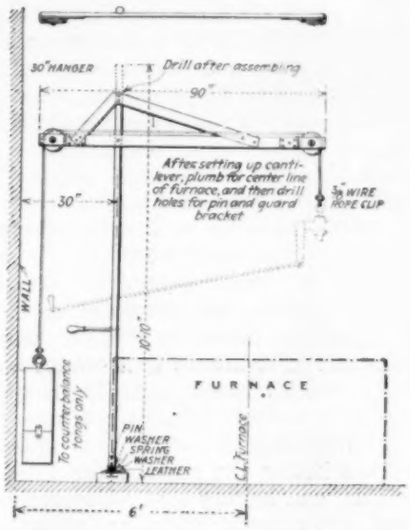


FIG. 14. DETAILS OF THE CRANE

One other noteworthy procedure in this department is the method of handling the cooling lubricant used in grinding. A common tank set into the floor in a fairly central position receives all the overflow from the different machines by means of piping suitably placed under the floor. Here the lubricant is filtered and pumped back to the different machines.

The position of the inner set of ball races in the base stand, which also gives an idea of their importance in the easy turning of the whole mount, is shown in Fig. 18. In this connection attention should be drawn to the necessity of accurate work in the concentricity of these bearings as well as of the wormwheel, or training circle, and the worm which moves it. There must be no lost motion and at the same time the carriage must move freely at every point of its 360-deg. travel.

Echoes From the Oil Country

BY W. OSBORNE

How much work will a properly designed and built machine do, if it is used rightly, before it is worn out?

You fellows who design, build and use machines may as well begin to gather up bricks for I am sure that you will all want to heave some in my direction. If I could induce you all to get together and agree to work in unison so that you would all agree on each point that deserved a good shower of bricks before any throwing was done, so that you might all throw at once, I would feel perfectly secure. As I cannot do that, I very well know that all of you will want to throw bricks some of the time and feel that brick throwing is out of place at other times but that you will so far disagree that there could well be a shower of bricks from some direction all the time.

A friend of mine and I were discussing this subject and one of the results was that it was easy to see that all sides might not agree. I got the notion that it might be well to make a good showing of facts and figures if I continued to maintain that most properly designed, built and used machines did not wear out, and that when machines do wear out they are either improperly designed, improperly built or improperly used. Does that make you feel like picking up a brick? Well, just hold it. Don't throw it out of your turn anyhow.

I know of a 15-hp. gas engine that has been running so many years that the revolutions number more than five hundred million and of course that means that the piston head has gone that number of times each way in the cylinder so it has made one thousand million strokes. While tests of the load have not been made yet, it is believed that it has been working at least up to its rated horsepower.

Attention is called to the piston because in a gas engine that is where a very little wear makes a lot of trouble, for that type of engine has to be started by hand. The ignition is by a hot tube without any timing valve. As the firing is caused by the compression and as there is not any way of changing it, any leak that causes loss of compression will interfere with starting.

CYLINDER NEVER REBORED

This engine, with 24 years of work to its credit, has never had the cylinder rebored, nor a new piston ring put in and the man who runs it says that it starts as easily as it did when first put in. The same man has run it all of these years. He is not a mechanic or an educated engineer, and running the engine is but a small part of his duties. The crank bearings are all babbitted bearings and they have never been renewed. There are two connecting-rods. The main one from the main piston to the crank has bronze brasses in the piston end and those in the other rod are both bronze. All of them are those originally put in.

The piston spoken of in relation to the number of strokes is the one that receives the force of the explosion. Another piston has comparatively light work as it works in the charging cylinder, and it has never had any repairs of any kind.

You may ask if this is an average performance for this make of engine and to that I would say no, but I would also say that there are others that are at least as good for some of these engines are run constantly day and night.

The reason for the good results are at hand. This engine has received sufficient attention to insure that it was properly lubricated, that the tank was full of water that circulated through the water jacket of the explosion cylinder, that the gas was turned on to the proper mark on the dial cock and that all other parts that could be fussed with were given a very positive and continuous letting alone.

Many years ago Chordal told of a fellow who made some bearings in a machine, a planing machine I think it was, that were plain round holes which were bored in the sides of the main frame.

These bearings as bearings for the shafts which ran in them were fine and never gave any trouble and never wore out. They did give a lot of trouble in the

minds of a lot of users who, even if convinced that such bearings would never wear out, still desired to have means of adjustment made. I am not sure, but it seems to me that the maker changed those bearings to suit the mind of his average customer. Of course he was, in a way, justified in doing so. One of the greatest joys to be found in the lives of some men is found in the ability to go over some machine and change things. The less the knowledge and ability of the man and the more complicated the machine the greater the joy and the greater the willingness to feel it. Apparently another great joy is the one of being able to point to the results and using them as an illustration of the lack of capacity of the designer.

Now, in many cases is not the designer to blame? Did he not put in more adjustments than were necessary? Did he not put temptation before his brother man? Did he not, by implication, tell users that his bearings would need adjusting by making them adjustable?

The most vulnerable parts of general machinery are the bearings and these are usually made adjustable in some way.

Consider a bearing for a round shaft. Assume that the shaft has been correctly designed to do its work. The bearing must be long enough to give surface that will not have excessive pressure. Assume that this has been done. Make also the assumption that both shaft and bearing have been properly made and adjusted and what more is needed? Lubrication.

If such a bearing receives constant, even, continuous lubrication with the proper kind of oil or grease why should it ever wear out?

Lately we have been hearing about some wonderfully accurate true-to-size gage blocks. These blocks are lapped to size, and it would be interesting to know how fast they would be reduced in size with good lubricating oil and nothing else being used as the lapping material and the pressure being such as a bearing should stand. By using a century as the unit of time and a light wave as a unit of measurement, standards of wear might be established.

But, it may be urged, bearings do wear out, lots of them. Yes, lots of bearings get too loose for use and why?

When a shaft fits too tightly in its bearing, or is insufficiently lubricated, or is overloaded it gets warm, and expands, and one of the effects of expansion is to increase the diameter. Another one, is to warm the bearing and it also expands but as the heat is coming from the inside, the inside is warmer than the outside and the hole gets smaller. Oil good for normal conditions gets thinner and poorer when heated and does less lubrication, and less lubrication means more heat and that means still poorer oil and that again means more heat and so on just like the high cost of living and the increases it makes necessary. A tight bearing produces heat, and heat makes the bearing tighter, and the tighter bearing makes the heat hotter, and that makes the tighter bearing more tight and so it goes until things get intolerable and the bearing either cuts itself loose or sticks fast and stops operations.

For bearings of from 3 to 6 in. in diameter some good authorities give a difference in size between the hole and the shaft of from one one-thousandth to one and one-half one-thousandths for each inch of diameter, and so a 4-in. shaft would be from 4 to 6 one-thousandths loose in its bearing before being oiled up and running. Enough oil to allow a shaft to be turned freely in its bearing will not make much of a showing in a space of even four one-thousandths. Imagine how such a bearing will be for clearance when it is adjusted to a "feel."

While there are many differences according to materials and working conditions yet there is a maximum pressure above which any bearing will give trouble. Any condition that puts the pressure higher than the maximum for a bearing is a bad one.

It might be interesting to consider what kind of a pressure can be produced when a good well-fitted bearing has been too tightly adjusted and begins to warm up. If a 4-in. shaft that fits into a rigid and well-supported bearing should be adjusted to have one one-thousandth clearance and should be heated so that it expanded so that it was three one-thousandths of an inch larger than the hole a little pressure of about 15,000 to 20,000 lb. per sq.in. would reduce it to the size of the hole.

To expand a shaft a thousandth of an inch for each inch of diameter would mean the temperature of it would have to be raised nearly 170 deg., but most of us have seen bearings "sizzling hot."

The more rigid the construction and the better the workmanship the more necessary that the bearing have the proper amount of clearance that cannot be changed by the incompetent if trouble is to be avoided.

It may not be possible to make machinery without any means of adjusting for wear, but the nearer it can be done the better the results, for I believe that being adjustable, and having that adjustability worked at, wears out more machinery than all other causes combined except lack of lubrication, and it is even far ahead of that.

Facing Pedestals on an Angle

By I. B. Rich

The way in which comparatively small shops in various parts of the country contributed to the building of ships is indicated in the accompanying illustration from the shop of the Fitchburg Steam Engine Co., Fitchburg, Mass. The work is one of the pedestals

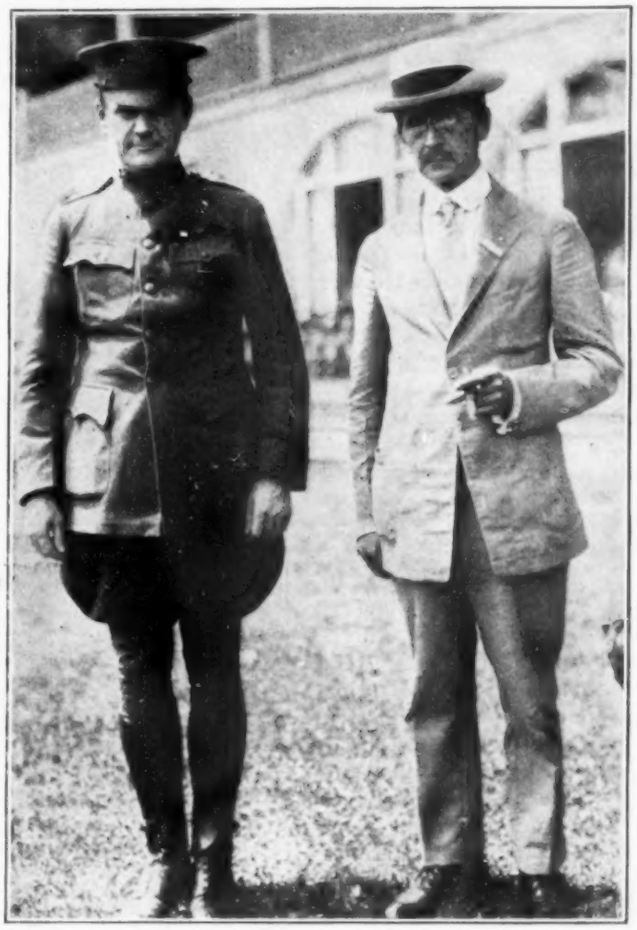
FACING PEDESTALS ON AN ANGLE IN ENGINE LATHE

of a frame of a vertical marine engine and as the pedestal helps to form a sort of "A" frame, the ends must be faced at the proper angle.

To do this in a lathe, the only machine available for the work, the ends had to be laid out and centered so as to swing the column at the proper angle, as shown. After the centering was accomplished it was a plain job of facing the ends, using the cross-slide on the carriage. The driving of the column was a simple matter, angle irons bolted to the faceplate serving as dogs or drivers.

Summer S.A.E. Meeting

THIS year's summer meeting of the Society of Automotive Engineers was held at Ottawa Beach on the eastern shore of Lake Michigan. This is something of a departure from the custom of holding the meetings in cities where numerous plant-inspection trips could be organized, and met with unanimous approval. Over 750 reservations were received and many unexpected late arrivals were squeezed in where possible. The committee on meetings received congratulations from all sides on the arrangement of the various events. Technical sessions were begun at ten each morning and continued until lunch time. From two until six, the members and their guests went in for whatever sport held out the greatest inducements: baseball, tennis, golf, fishing, swimming, trap shooting, track and field sports, etc. Dinner attracted the earnest attention of all hands from six until eight and the evenings were devoted to popular lectures, dancing and strolling on the boardwalk. As many members brought their own wives with them, the last-mentioned pastime was not so widely indulged in as might otherwise have been the case. A detachment from the Hyatt Roller Bearing Co. arrived Sunday and made arrangements with a printer in the nearest town by which they were able to bring out a four-page paper each morning entitled "The Daily Sae." This sheet made a big hit. It contained an account of the previous day's doings, the schedule for the day, more or less pointed personals and some clever parodied "Ads." There were also letters (with apologies to Ring W. Lardner) from Jack Carey to his friend Al, telling of Jack's tribulations in reaching Ottawa Beach and his impressions of the crowd after he arrived.



PRESIDENT MANLY AND GENERAL WILLIAMS, CHIEF OF ORDNANCE

At the business meeting on Monday evening, President Manly reviewed the achievements of the automotive engineers in the war and touched on some of the problems ahead of them. He made a plea for more systematic and intensive research work and also laid stress on the need for real engineering work in the operating and maintenance of automotive machines as well as in their design. Mr. Manly spoke of the really valuable work of the society in standardization, but pointed out the insignificance of the work already accomplished compared to that of the immediate future.

The Tuesday morning session listened to papers on "Tests of Truck Axle Worms and Bearings," by K. Heidlhofer; "Motor-Truck Ability and Its Relation to Trend of Design," by L. P. Kalb; "Steel Truck Wheels," by P. W. Klinger; "Protective Coatings for Metals," by E. T. Birdsall, and "The Engine-Fuel Problem," by Dr. Joseph E. Pogue of the division of mineral technology, United States National Museum, Washington. The last-named paper provoked the usual hot arguments on whether to suit the fuel to the engine or the engine to the fuel. The problem would seem about as likely of solution as the famous egg and chicken problem, except that in this case the egg can talk things over with the chicken. The means for so doing has been provided in a combined committee of fuel and engine men which promises immediate results in standardized and stabilized fuel for at least two years ahead. At the passenger-car session on Wednesday morning papers were presented by title on "Liberty Engine Materials and Their Use in the Automotive Industry," by H. F. Wood, and on "Load-Carrying Possibilities of Angular Contact Type Ball Bearings," by F. C. Goldsmith. Most of the session was devoted to the symposium and discussion on the future passenger car, for which papers had been prepared by E. H. Belden, H. M. Crane, L. H. Pomeroy, H. C. Snow and W. B. Stout. The discussion on some of the statements made in the papers was lively.

Mr. Stout mentioned the discoveries made by aircraft engineers and manufacturers as to the possibilities of plywood for fuselage and body work. He prophesied the development of a five-passenger closed car to weigh less than 1000 lb. with a mileage of 30 to 40 per gallon of gasoline and 10,000 to 15,000 per set of tires. The engine would not have to be of more than 15 hp. and might be air-cooled, but would have to be very well made.

THREE-TON TANK

Mr. Belden mentioned a new car of light weight, less than 2000 lb., with 100-in. wheelbase and 130-in. spring base which would carry five passengers with comfort at 60 miles per hour and hold the road very well. The spring suspension was called the three-point cantilever, the front springs being entirely forward of the front axle and the rear springs behind the rear axle. He also said later in the discussion that the Overland people would equip all their cars except the smallest model with sleeve-valve motors and that they were working on an air-cooled, sleeve-valve engine for it.

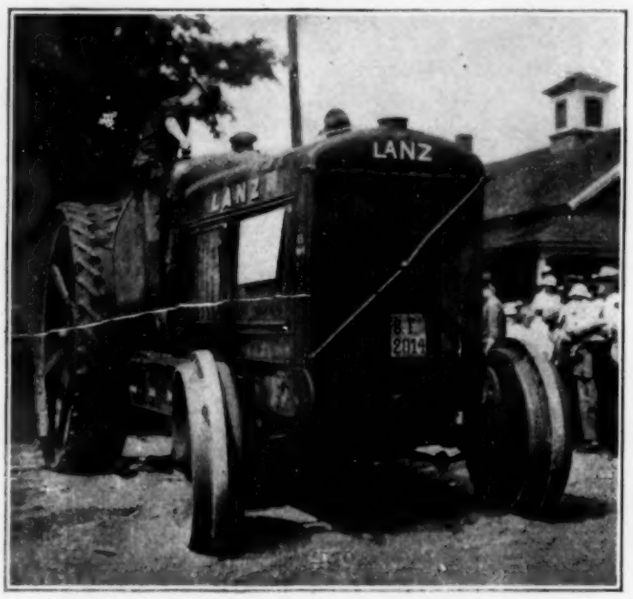
Mr. Crane in his paper pointed out the transition of the automobile from a sporting vehicle to a means of transportation—a change which had made the closed body the standard type with necessarily heavier chassis and frame. He also looked for a reduction of weight in the future due to improvements in design. Unfortunately, Mr. Crane was unable to be present to join in the discussion as was also Mr. Pomeroy. Mr. Clayton, who read Mr. Pomeroy's paper, pointed out the difference between our practice and that of Europe. Here the motor car is 99 per cent. a means of transportation and 1 per cent. a pleasure vehicle. There, before the war, 75 per cent. of the use of the automobile was for pleasure, a figure which war conditions and lessons have reduced to about 50 per cent. Mr. Pomeroy also advocated the light-weight, low-powered, four-cylinder car.

Mr. Snow's paper which was abstracted in his absence was much more conservative in tone. He divided cars into three classes, light, medium and heavy, and looked for greater use of four-speed gear boxes, better chassis lubrication, and reduction in the use of engines of more than six cylinders.

8-IN. HOWITZER ON SELF-PROPELLED MOUNT

In the discussion, Colonel Vincent called attention to a very important point which had received little notice in the papers. He said that the engineer would have to build a car to suit the buying public and that the cry was for performance rather than economy. He drove home his point by telling of the first meeting of L. A. Pomeroy and Mr. Leland, who was at that time still at the head of the Cadillac Co. On that occasion, after Mr. Pomeroy had inspected the Cadillac plant, he asked Mr. Leland why, with such facilities, he did not build a light-weight, high-grade, four-cylinder car with superior economy instead of the heavy, expensive-to-operate, high-powered eight. Mr. Leland replied that, as an engineer, he was thoroughly in sympathy with Mr. Pomeroy's ideas and that he would be building just such a car except for the one fact that nobody would buy it.

The Army and Navy session on Thursday morning



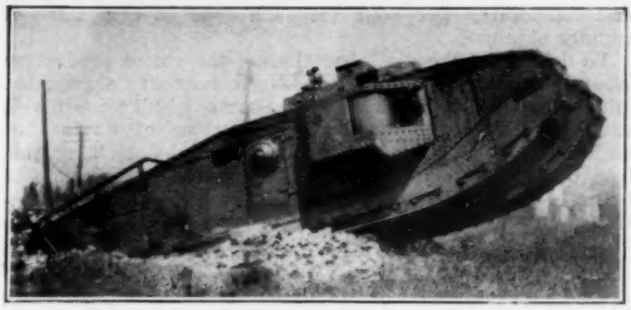
CAPTURED GERMAN ARTILLERY TRACTOR

was one of exceptional interest. The Chief of Ordnance, Gen. C. C. Williams, talked on the future relations of the automotive industry with the Ordnance Department. He was followed by representatives of the Department of Military Aëronautics and the Motor Transport Corps.

A paper on the "Development of 'NC' Boats and Other Naval Aircraft" was presented by Commander J. C. Hunsaker, U. S. N.

In the afternoon, an excursion across the inlet was made to view the Ordnance Exhibit in action. More than a million dollars' worth of automotive ordnance equipment had been collected and sent to Ottawa Beach for the convention at a cost of $35,000. The members saw demonstrations of baby tanks and the huge 40-ton Mark VIII tank, German trucks and artillery tractors, mobile shops, guns of several calibers and American artillery tractors. An old cellar 10 ft. deep was found for the big tank to exercise on and it performed with true tank resistlessness and imperturbability, wandering in and out of the hole with ease.

The last session was held Friday morning. Prof. C.



MARK VIII TANK IN ACTION

A. Norman gave a paper on "Working Processes of Future Combustion Engines;" Prof. E. A. White, one on "Relation of Tractor to Implement," and H. P. MacDonald, one on "Electric Heat-Treatment of Steel." Unfortunately, many members had left before this session.

On Tuesday evening, a lecture with slides and demonstrations of wireless telephony was given by E. H. Colpitts of the Western Electric Co. A conversation was held with a party on board Webb Jay's wireless-equipped yacht out on the lake. The conversation was made audible by a loud-speaking receiver in the lecture room. Finally, the boat party was connected with Chicago over the regular telephone lines through a switchboard connection in the lecture room and this conversation was also made audible.

On Wednesday, Dr. John Johnston of Yale lectured on "Gas Warfare" and described the problems and achievements of the men engaged in that work, and on Thursday, Colonel Slade gave a talk on "Experiences with the A. E. F. and the Armistice Commission" with movies of army life at the front. This was followed by the grand ball which rolled along until the wee smalls on Friday.

As a get-to-gether meeting and friend-maker, the convention was a huge success, partly because of the sports and social program and partly on account of the fact that there was practically no one else in the place and nowhere to wander off to in small parties. It is a system which might well be followed by other organizations seeking to promote a better acquaintance among the members.

Die Cost as a Factor In Selling Forgings*

By R. T. HERDEGEN
Dominion Forge and Stamping Co., Walkerville, Ont., Canada

THERE probably is no subject connected with the drop-forge industry that receives more attention from a sales or cost point of view than the very vital subject of die charges and die costs. I wish to present the die question from several points of view, and will indicate several methods of die charging, considering both the original die charge and the continuous die expense. It would seem desirable to have the association adopt some standard method of charging initially for dies, and I trust that some such action may result from this paper. The question of obtaining and apportioning continuous die expenses will also be considered.

It has long been the practice in the drop-forge industry, when quoting a price on a new forging job at so much per piece, or per hundred pieces, to make a die charge to the customer. On a repeat order, the customer is not asked to pay a die charge and, furthermore, he expects to get a reduction in the unit price of the forgings, due to the fact that the drop-forge company has had experience in making the part in question. It is evident, therefore, that in the original per piece quotation on forgings, a die charge per piece must be figured in the cost, because if this is not done the repeat order from the customer will of necessity be at a higher price to take care of die renewals. The original die charge, therefore, which is made on the first order, is in the final analysis really a charge to cover experimenting.

If the customer places a large order, that is, an order so large that it will use several die impressions to complete the same, the forging company can feasibly consider the waiving of the original die charge, feeling that the length of the run will enable it to satisfactorily wash out the experimental charge; it being understood, of course, that the unit selling price for forgings includes the cost for die renewals and repairs.

The time for payment of the original die charge should also be standardized. If a customer's credit is doubtful the original die charge should be demanded on the receipt of the order before any work is done on the dies, as a protection against financial loss to the forging company. If a customer is of this type, however, it is questionable whether it is desirable to accept his order. In general, it would appear fair to both parties to have the customer pay the die charge on his approval of the submitted lead proof, but before the delivery of any forgings.

Although the die charge as discussed above eventually works out as an experimental charge against a customer for a new order, the questions as to what this charge should be and as to how it should be determined are of vital importance. It should certainly bear a relation to the actual cost of the dies, but it is questionable whether it is desirable to load an order with the total actual die cost. In discussing dies, we will consider the trimmer dies, and the dies for any auxiliary operations, such as bending, as comprehended under the general term "dies." The actual cost to a drop-forge company of a die unit is the sum of the actual material used in the die blocks themselves, plus the labor involved in their sinking, plus the portion of die-room overhead chargeable against them.

Under material is included, in addition to the die blocks themselves—trimmer steel, chair castings, and other material purchases. The labor item is that portion of the workman's time which can be charged directly to the dies and other tools for a certain specific job. The die-room overhead is considered approximately 150 per cent. of the direct productive labor. It seems desirable to have the first die charge sufficient to cover the material used and labor required in making the dies, but not great enough to cover the die-room overhead involved or any profit.

In considering the removal of the dies from a forge plant, we have always taken the stand that the dies belong to the forging company, regardless of the fact that the customer pays an initial die charge, which is computed as mentioned above. If a customer wishes to remove the dies for one of his forgings from a drop-forge plant, he should pay in addition to the original die charge, which included only material and labor, an additional charge sufficient to cover the overhead involved, and to yield a profit, inasmuch as the removal of dies from the forge plant really constitutes a sale. Data collected by the writer in the last three years indicate that the total charge for material and labor on a die is usually somewhat in excess of the overhead involved. A doubling of the original die charge, computed as described above, is therefore sufficient to reimburse the forging company for the overhead chargeable to the dies and

*Paper presented at the annual convention of the American Drop Forge Association at Pittsburgh, Penn., June 12, 13 and 14, 1919.

Note

On page 667, Vol. 50, there appeared an article by E. H. Kreider, under the title of "Students' Chart." The figures used in the chart were used by the author, E. H. Kreider, under a misapprehension, as they were originally copyrighted by Robert H. Smith and used in his "Textbook of Advanced Machine Work." It is always our intention to give proper credit to all those from whom quotations are made, and we regret that this oversight should do an injustice to Mr. Smith and to his copyrighted textbook.

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will in addition yield a slight profit. The writer has, therefore, adopted the practice of permitting the removal of any set of dies from the plant on the payment by the customer of an additional sum equal to the original die charge.

Figuring the Cost of Dies

In figuring the unit selling price on the forgings plus the the cost of dies, it is interesting to consider whether the cost of the dies is more a function of the character of the forging itself than it is a function of the particular type and size of unit in which that forging is made. It is doubtless true that in a collection of a dozen forgings, all of which may be made in a 1500-lb. steam hammer, the cost of the dies for one will be greater than the cost of the dies for another. Is it not also true that the mishaps which happen to dies, due to defective blocks, poor sinking, or improper heat-treatment, may play a more important part in their life, and in the die cost per forging than the character of the forging itself?

If a company considers that the die cost is preëminently a function of the character of each forging and therefore when quoting the unit price on forgings wishes to figure each die cost independently, and to add the same separately to the other cost items for the forging, the following discussion is of no great interest. If, however, it is desirable to group an average die cost with the regular forging overhead, then the method of obtaining and adding this die overhead into the general drop forge shop overhead is of interest.

If a forge company expresses its overhead as a percentage of the direct labor in the forge shop, it is a simple matter to take the entire cost of die material, die labor and die overhead for a year, and determine its relation to the productive labor of the forge shop for the same period. This enables one to find the proper per cent. to cover die charges, which is then included in the general drop-forge shop overhead percentage. Results at the writer's plant last year indicated that the sum total charge for die material, die labor and die overhead were equal to about 125 per cent. of the productive labor.

What the Die Charge Includes

If a shop is not expressing its overhead in per cent., but as a certain sum per hammer-hour, it is necessary to apportion the die-room charge throughout the hammer shop on the basis of so much per machine-hour. This die charge will include die material, die labor and die overhead, and although it will vary for different units, there will be the same die charge made per hour on any certain hammer for every job run in that hammer. Offhand this would appear to be rather to the advantage of a piece requiring difficult dies, but when it is considered that this piece is probably produced slower than a piece requiring simple dies, it is apparent that the die charge per forging will be greater in the case of the difficult piece, due to the smaller number that is made per hour. This will eliminate the error which might appear to be in this method.

I determine the die material charge per hour for each unit in the following manner: The average size of die blocks used with each type and size of unit is noted and their material value figured. The number of impressions usually obtainable from each size die block being known, and also each impression's average life in hours, the proper material charge per hour for each type of equipment is rapidly obtained.

To determine the die labor charge, the entire productive labor charges of the die room for a year are segregated and charged against the forge units in which each die is usually used. Knowing the total number of hours that each type of unit ran during that year, by dividing this into the yearly charge against each unit it is possible to immediately obtain the labor die charge per hour of operation for each unit.

Determining the Die Labor Charge

The die-room overhead is apportioned on a percentage basis, against the die-room productive labor mentioned above. In obtaining these results it is interesting to note the relation of hour rates, for die material and for die labor for the various classes of equipment, was very similar. The sum of these three charges against each unit represented the hourly charge for every die for that unit.

The table indicates the results obtained by the writer for various classes of equipment.

DIE COSTS PER HOUR FOR DIFFERENT FORGING UNITS

Size and type of unit.	Die rate per hour
1000 lb. Board Hammer	$0.75
1500 lb. Steam Hammer	1.50
2500 lb. " "	2.50
5000 lb. " "	3.00
1¼ in. Upsetter	.75
4 in. "	1.50

Summarizing the subject of the original die charge, I would recommend that an original die charge always be made on the acceptance of an order for new forgings; that this die charge be equal to the material and labor involved in making the dies, which charge should be paid on the approval of the lead proof by the customer; and, furthermore, that a customer be allowed to remove dies from a forge shop only on the payment of a sum equal to the original die charge. It should also always be borne in mind that the die charge is only an experimental charge and that in quoting a piece price on forgings the die expense should always be included in the cost.

Taper-pin Wedge for Boring Bar

By E. A. Dixie

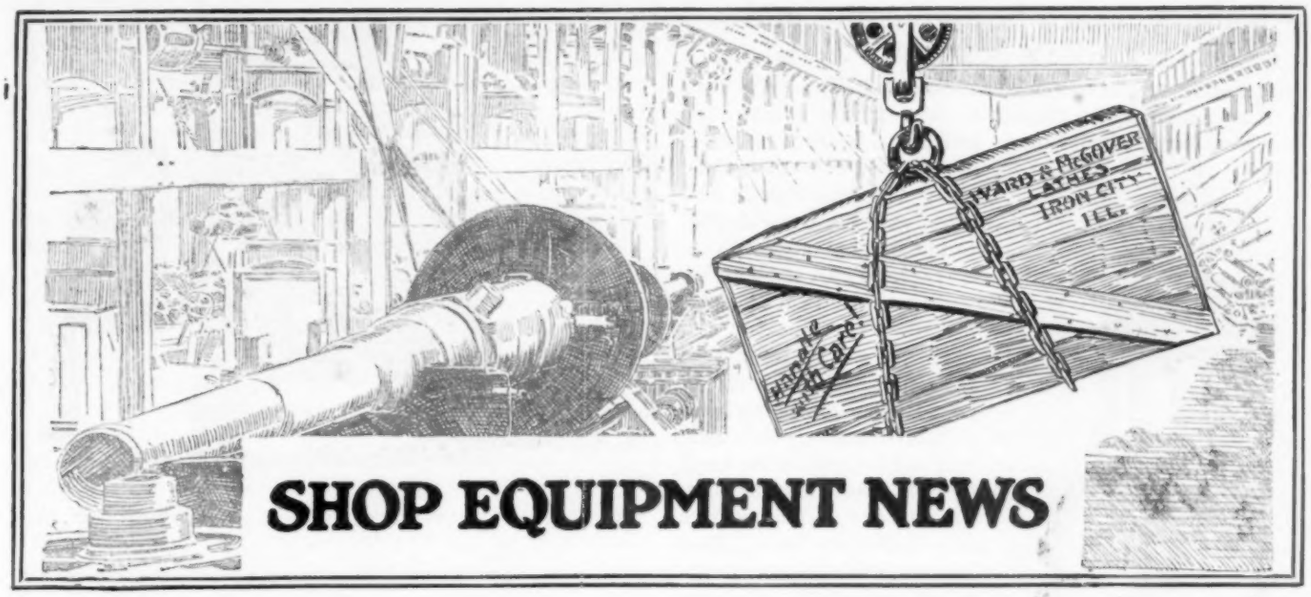
At first glance the article on the above subject on page 1195, Vol. 50, appears to be a simple solution of a trouble we have all encountered, but one objection to it is that it will not work because:

Unfortunately for this application a taper-pin is tapered all around, so even if the slot is cut as shown for the cutter, the taper pin will *jam on the sides.*

The solution of the problem of securing boring-bar cutters with the pin type of fastening is to drill and ream a *parallel* hole at an angle of 80 to 85 deg. to the axis of the bar, slot out the opening for the cutter, mill a flat on one side of a piece of cold-rolled steel or drill rod the size of the drilled hole. This flat should be at an angle to the axis of the round stock used, equal to the difference between the angle of 80 to 85 deg. (at which the hole was drilled in the boring bar) and 90 deg. In other words it should be 5 to 10 degrees.

Another objection is that the cutter would have to be tapered the same as the tapered pin; that is to say, if the tapered hole is reamed square with the boring bar. However, the thing won't work so why worry about the cutter?

With the cylindrical pin tapered on one side the front and back faces of the cutter should be parallel. As such cutters are usually made from bar stock which is already approximately parallel, there is less work in making them parallel.



SHOP EQUIPMENT NEWS

"Volyum" Centrifugal Pump

The Volyum Pump Co., 419 West Liberty St., Cincinnati, Ohio, has just brought out a new vertical centrifugal pump, known by the trade name of "Volyum" and intended especially for supplying the coolant for machine or cutting tools. Fig. 1 shows an outside view of the device, while Fig. 2 is a sectional view showing the construction. The impeller is of the open type, mounted on the lower end of the vertical shaft and extending the full depth of the semi-spherical body, there being no contact between the impeller and the body casting. The bearings for the impeller shaft are both above the water line; one of these bearings is formed by the stuffing-box gland that is located just above the impeller, while the second one is in the cap. The drive from the pulley is through two spiral gears, placed at right angles and having a 3 to 1 ratio. The large gear is mounted on the driving shaft and runs in oil in the chamber formed by the cover, this oil serving to lubricate both the shafts and the thrust bearings, as well as the gear teeth themselves. A 3-in. flanged pulley is standard equipment, although a gear or sprocket wheel can be substituted if desired. The pump can be mounted on either the side or end of a machine, as desired, various angles of drive being obtained by swiveling the cover in relation to the body and by reversing the position of the pulley. In order to eliminate the loss of the liquid necessary for priming, the suction pipe is located above the delivery box and the body thus retains a full supply of liquid. The pump is at present made for ¾-in. pipe connections, and has a capacity of from 5 to 22 gal. per minute, depending upon the speed.

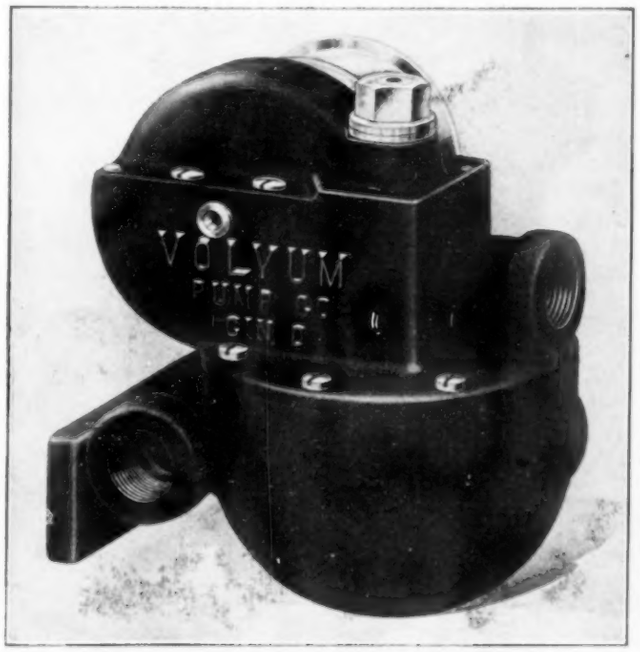


FIG. 1. "VOLYUM" CENTRIFUGAL LUBRICANT PUMP

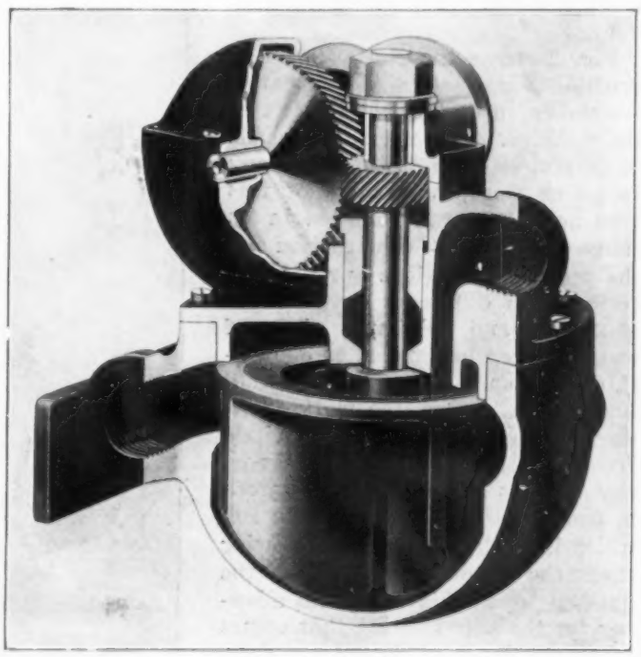


FIG. 2. SECTIONAL VIEW OF THE PUMP

Kane & Roach Straightening and Bending Machines

Kane & Roach, Niagara and Shonnard Sts., Syracuse, N. Y., has recently placed on the market two new machines, one a straightener and one a bender. Fig. 1 shows the No. 00 straightener. The machine is believed to be one of the smallest ever put on the market. The rolls on the machine are spaced only 1¼ in. from center to center, are 2 in. long, and are supported by bearings on both ends. The upper rolls are entirely incased, and are raised or lowered by the crank handle that adjusts the screws at the top of the machine. The screws are equipped with gages so that the rolls can be quickly adjusted to any size work within the capacity of the machine, this feature also making it possible to set them in line. The four lower rolls and two of the upper are driven by gears. The gears are all cut and drive the rolls at a speed of from 300 to 350 r.p.m., depending on the class of work being handled. The machine will handle short work and it is claimed that it will straighten the pieces all the way to the end.

FIG. 1.
NO. 00 STRAIGHTENER

Center to center of rolls, 1¼ in.; size of rolls, 1⅝ in. in diameter, 2 in. long; speed of rolls, 300 to 350 r.p.m.

Fig. 2 shows the No. 29 bending machine for small circles such as are shown on the floor at the left of the machine. This machine is made in several sizes so as to handle any range of work, a machine of this type being somewhat limited in its range on account of construction and the peculiar operations it must perform. The difference between the maximum and minimum sizes of work that can be handled on one machine is from 1 in. to 1½ in., depending on the size of the work. The work is bent into a complete circle from end to end, without leaving any straight or flat spots. The work is bent on the upper or inside roll which is of slightly smaller diameter than the inside diameter of the finished work, this difference allowing for the slight spring that occurs after the bending has been done. The upper roll may be removed so that rolls of different diameter may be used. The rolls are supported at both ends and driven, the upper one being arranged that it will raise and release so the finished cylinder can be pulled off the end. Adjustment for different thicknesses of material is provided for so that the same stock does not have to be used at all times. These machines are built to make cylindrical work as small as 2 in. in diameter.

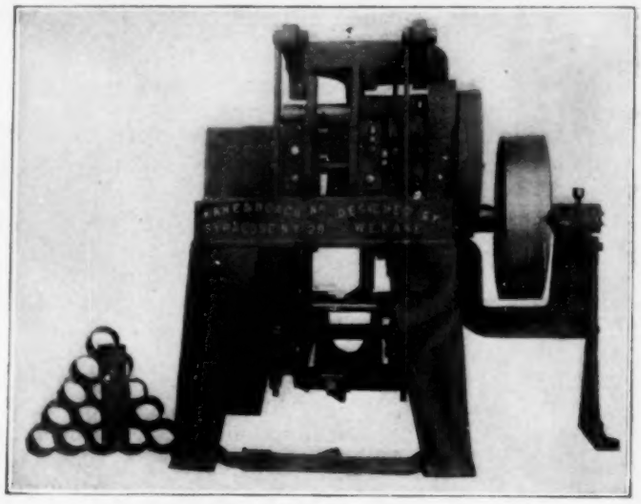
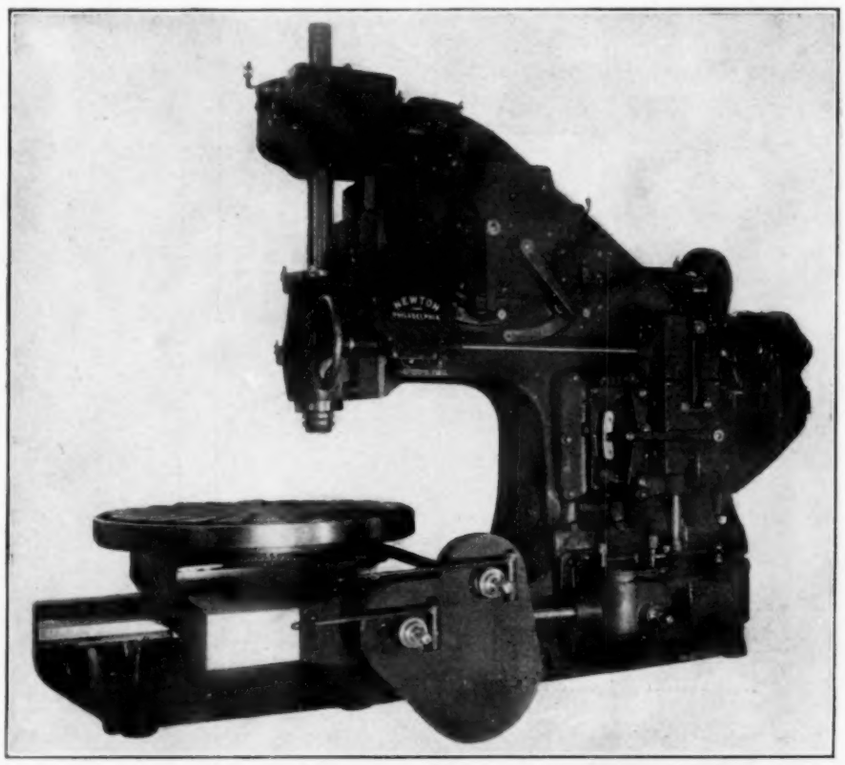


FIG. 2. BENDING MACHINE FOR SMALL CIRCLES

Newton Heavy-Duty Vertical-Spindle Milling Machine

A new heavy-duty vertical-spindle milling machine, shown in the illustration, has recently been placed on the market by the Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Penn. This machine has a capacity of 50 in. between the center of the spindle and the frame, and is of rugged construction.



NEWTON HEAVY-DUTY, VERTICAL MILLING MACHINE

Diameter of spindle through driving gears, 6 in.; diameter of spindle in main bearings, 6¾ in.; diameter of table on working surface, 60 in.; diameter of table over pan, 66¼ in.; crossfeed, 65 in.; in-and-out feed, 50 in.; maximum height from table top to under side of frame and vertical spindle, 44¼ in.; vertical traverse of spindle, 24 in.; distance from center of spindle to frame, 50 in.

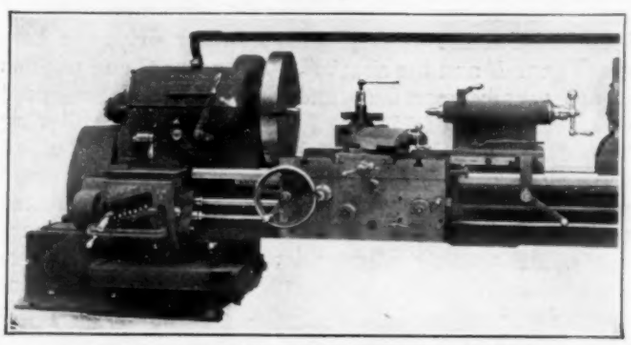
The machine, however, embodies all the refinements for production and control usually found in smaller sizes of machines. Among the features cited are an extensive range of spindle speeds and table feeds, in circular, longitudinal and transverse directions; the provision for spindle saddle feeds vertically; the incorporation of reversing fast power traverse for these same movements; and the simplicity of control. The machine is not only applicable to various milling operations, but can be used for boring or finishing holes when the use of boring cutters is required.

The spindle revolves in bronze bushings in the spindle saddle and is fitted with a retaining drift key and with nuts for the control located on the outside of the spindle nose. The drive is through a worm and wormwheel from a speed box, and various speeds are obtained by means of gears that are mounted on sliding sleeves controlled by latch levers located outside of the cover. The spindle saddle has side adjustment maintained by a taper shoe, is counterweighted and has hand vertical adjustment in addition to reversing feed and reversing fast power traverse.

The circular table is surrounded by an oil pan cast solid, and has a full bearing on the saddle, to which it is held by corner clamps. The bearing is of the annular type, of large diameter and of substantial depth. The circular table has reversing feed for the circular, in-and-out and cross motions, in addition to reversing fast power traverse and hand control for all movements; each movement being independently clutched. The saddle on which the circular table is mounted has narrow guide alignment control on the cross-slide, and is fitted with a taper shoe. The cross-slide has square bearings on the base and is also fitted with a taper shoe.

Bradford Geared-Head Lathes

The Bradford Machine Tool Co., Cincinnati, Ohio, has just placed on the market a new line of geared-head lathes that are manufactured in 14-, 16-, 18-, 22-, 24-, 26-, 28-, 30- and 32-in. sizes. These machines are made for either motor or belt drive, the motor or pulley being mounted at the rear on the base of the machine close to the floor. The driving mechanism is located beneath the bed and operates through a selective-speed gear box, through a silent chain drive to the spindle. The claim for this system is that it reduces vibration and gives a smooth noiseless drive, resulting in work free from chatter marks. Gear shifts through the selective gears in the speed box can only be effective by momentarily disengaging the drive. Where belt drive is used, the machine is belted directly from the line shaft to a single pulley, no countershaft being necessary. Twelve spindle speeds may be obtained as well as corresponding reverse speeds, a rod controlling the speed-box lever running the full length of the machine in order to be within convenient reach at all times. A friction brake is also incorporated to stop the lathe spindle after the power has been disengaged. The new type of lathes retain the regular Bradford style of centralized control obtained at the apron. Spindles are bored from solid bars of high-carbon crucible steel, ground to size and balanced dynamically. The spindle is mounted in adjustable, taper, bronze bearings and extends through the hood to permit the use of drawbars and tubes for draw-in attachments. For special work a ball thrust bearing may be provided if desired. The tailstock is of the overhanging type, permitting the use of the compound rest at right angles when turning work of small length. The carriage bears on the V-ways its entire length, and is gibbed front and back. The compound rest is graduated in degrees so that it can be quickly set to desired angles.

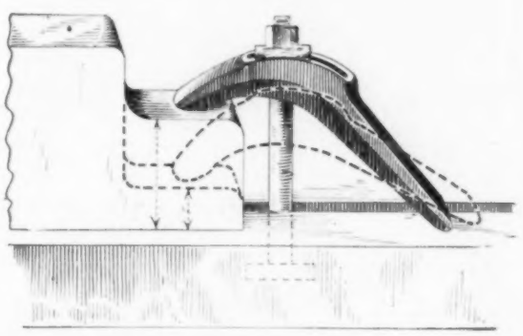


BRADFORD 24-IN. GEARED-HEAD LATHE

Sizes made, 14, 16, 18, 22, 24, 26, 28, 30 and 32 in. with actual swings over the beds of 14¼, 16¼, 20¼, 22¼, 25¼, 27, 28¾, 31¼ and 32¾ in. respectively.

Mathison Machine Clamps

Albert O. Mathison, 196 Carleton St., New Britain, Conn., is manufacturing a line of machine clamps for which a number of advantages are claimed over the ordinary straight type. These clamps are curved and are made in four sizes with over-all lengths 10, 8, 6 and 4 in. Each clamp has a washer or bearing block having a curved under surface that fits the curve on



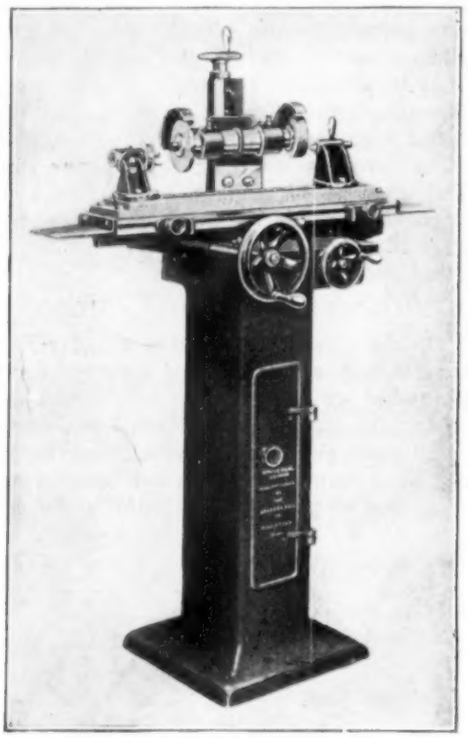
MATHISON MACHINE CLAMPS

the back of the clamp, the bolt passing through this bearing block with the nut resting on top. This feature allows the clamps to be used over a range of 4 in. without the use of blocks under the rear end, and it is also claimed that the clamps will hold work that is out of square or tapered. The thickness of the clamps is 1½ in. and the width of slot is ¾ in.

Draper & Hall Universal Grinding Machine

The Draper & Hall Co., Middletown, Conn., is now marketing a new universal grinding machine adapted for use on milling cutters, reamers, counterbores, taps, dies, end mills, arbors, etc. and also for internal and surface grinding. It is stated that the design is such that unusual stiffness and rigidity is given to the working table. The table has no overhang, but is supported its entire length by the longitudinal slide. The head swivels to any desired angle, and the machine can be

changed from cylindrical to surface work in one minute. The table is directly over the main column, in order to avoid overhang and reduce vibration to a minimum. The slide rests its entire length on the column, and the swivel table rests its full length on the slide and is provided with a screw adjustment for accurately aligning the centers. One end of the table is graduated for taper per foot and the other end in degrees in order to facilitate setting for taper work. The spindle is of tool steel, hardened, ground and lapped and runs in split phosphor-bronze bearings provided with means for compensation for wear. The longitudinal, vertical and cross feeds are



DRAPER & HALL UNIVERSAL GRINDING MACHINE

Swing on centers, 9 in.; longitudinal feed, 18 in.; vertical feed, 8 in.; distance between centers, 15 in.; crossfeed, 7 in.; top of platen, 26 x 4 in.; weight 750 lb.

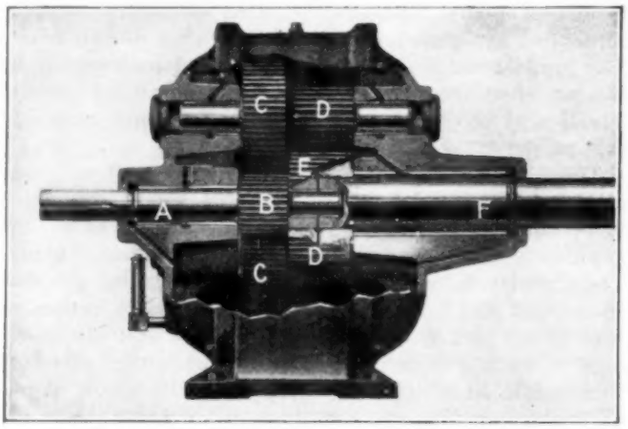
all graduated in thousandths, being provided with micrometer dials. Full universal equipment includes main countershaft, drum countershaft, universal vise, 3-in. chuck, V combination attachment, ball-bearing internal-grinding attachment with pulley and belt, hand table, adjustable tooth rest, tooth rest for spiral cutters, steadyrest, dogs and wrenches.

Chrobaltic High-Speed-Steel Casting Alloy

The Chrobaltic Tool Co., Railway Exchange, Chicago, Ill., is now marketing a high-speed-steel casting alloy that is known as Chrobaltic alloy. It is stated that this alloy can be cast into intricate shapes, and that it is suitable for milling cutters and other tools having multiple cutting edges, as well as for blanking, drawing and forming dies, hot and cold trimmers, and any variety of other tools that may be cast close to shape and thus avoid high machining cost. It is also stated that the castings have the appearance of a good smooth forging, that they are practically non-rusting and acid resisting and that their grain is uniform and dense. The steel may be hardened in oil or air and the process of annealing and rehardening can be repeated many times without deterioration in quality. Tools made of this material do not change their shape in hardening.

Jones Spur-Gear Speed Reducers

The W. A. Jones Foundry and Machine Co., 4401-4451 West 12th St., Chicago, Ill., has recently placed on the market a line of spur-gear speed-reducing mechanisms. The illustration shows the single-type speed reducer that is used generally for reductions up to a ratio of 15 to 1, but a double-type reducer is made that is used for ratios from 15 to 1 to 200 to 1, or over if desired. The construction details of the double type do not differ materially from the single type except that a total of four reductions is accomplished instead of two, the



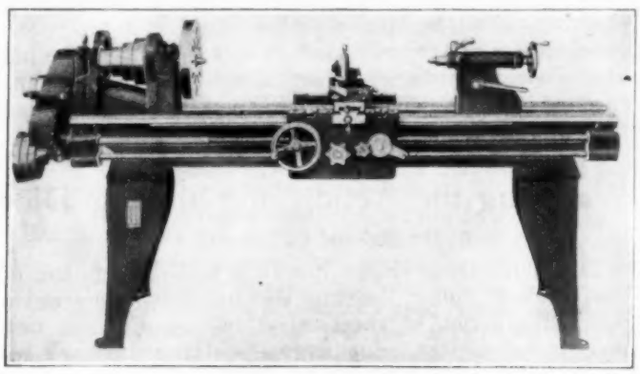
JONES SPUR-GEAR SPEED REDUCER

housing being increased in length to accommodate the necessary gears.

The reducer is a spur-gear type with the high and low-speed shafts concentric and having the same direction of rotation, and is designed for reducing motor or other speeds by connecting it directly with the high-speed shaft through a flexible coupling, while the slow-speed shaft is coupled direct to the driven unit, allowing it to rotate at any pre-determined reduced speed, for which the reducer is built. These machines are adapted for all classes of factory or plant equipment, and are frequently valuable where large speed reductions have to be installed in confined quarters and where positive operation is essential. Referring to the illustrations, the high speed shaft *A* and pinion *B* are forged from one piece of nickel steel, the shaft running in a bronze bearing at the left end and in a bronze bushing in the low-speed shaft at the right end. This pinion *B* meshes with and drives the three gears *C* that are mounted integral with the three pinions *D* which drive the low-speed gear *E* and the shaft *F*. The gears *C* and pinions *D* are equally spaced around the high- and low-speed gears at angles of 120 deg., this construction relieving both high- and low-speed shafts and bearings of all transverse loads due to tooth thrust. All the gears and pinions are made from steel forgings with generated teeth of the involute stub form with 20 deg. pressure angle. All shafts are ground to size and supported in bronze bushed bearings, the splash system of oiling insuring lubrication of all the parts. It will be noticed that the high-speed shaft is supported at its right end in a bronze bushing in the end of the low-speed shaft, this construction keeping the shafts concentric at all times.

Union Back-Geared Lathe

The Union Lathe Works, York, Penn., is now marketing the lathe shown in the illustration, this machine being made with bed lengths of 6, 7, 8, 10 and 12 ft. The spindle is hollow and made of high-carbon steel ground to size and runs in bronze bearings. A four-step



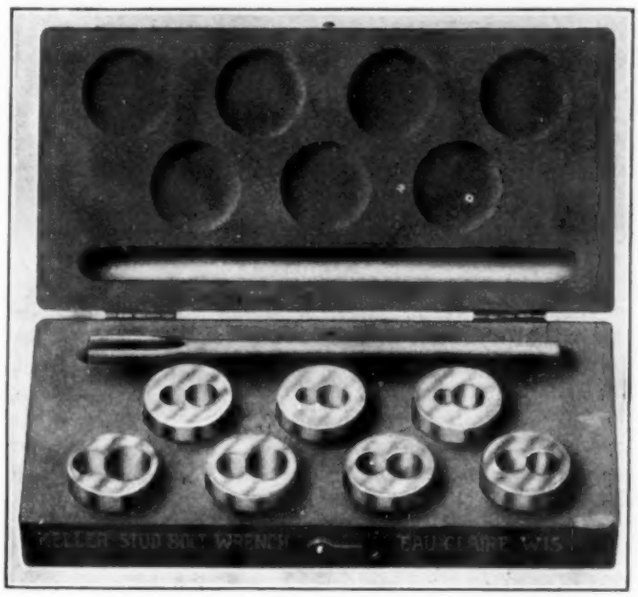
UNION BACK-GEARED LATHE

Swing over bed, 16¼ in.; swing over carriage, 11¼ in.; hole through sp'ndle, 1⅝ in.; taper in spindle, Morse No. 3; diameters of cone, 7¼, 6¼, 4⅝ and 3⅜ in.; lengths of bed, 6, 7, 8, 10 and 12 ft. with distances between centers of 35, 48, 60, 84 and 108 in. and weights of 1715, 1790, 1865, 2015 and 2265 lb. respectively.

cone pulley is provided which together with back gears gives eight speeds. The carriage has long bearings on ways, micrometer dial for crossfeed and a compound rest. The bed is braced and ribbed to insure rigidity. Standard equipment includes large and small faceplates, steadyrest, follow rest, toolpost, centers, double-friction countershaft, change gears, wrenches, etc.

New Keller Stud-Bolt-Wrench Set

The stud-bolt-wrench set shown in the illustration has been put on the market by the Keller Tool and Machine Co., Eau Claire, Wis., the set being intended for the removal of stud bolts which cannot be otherwise removed without damage to the bolt. These sets are made in two sizes, the smaller containing wrenches



THE KELLER STUD-BOLT-WRENCH SET

to fit stud bolts from ¼ to ⅝ in. in diameter in steps of $\frac{1}{16}$ in., while the larger set is made for four sizes of bolts, ⅝, ¾, ⅞ and 1 in. in diameter. In operation, the larger opening of the ring is slipped over the stud bolt and the grooved end of the wrench bar is inserted in the other opening, after which an ordinary wrench can be applied to the outer end of the wrench bar and the bolt screwed out in the ordinary manner.

Fischer Oil-Grooving Machine

The Fischer Machine Co., 310-316 North 11th St., Philadelphia, Penn., has just put on the market an improved form of the oil-grooving machine previously manufactured. The former machine would cut oil grooves on cylinders or in bores in a straight line parallel to the axis, in a circle in a plane at right angles to the axis and also around a bearing in a plane at an angle to the axis. The new machine, however, is so

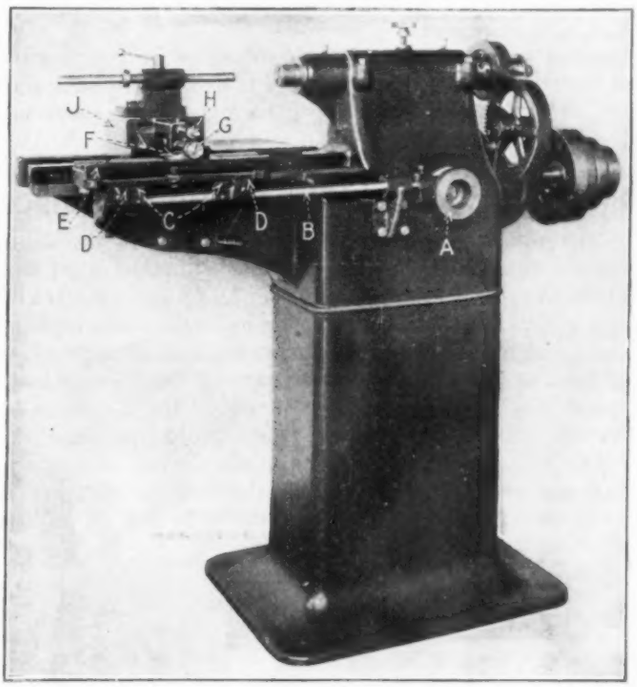


FIG. 1. BACK VIEW OF THE IMPROVED FISCHER OIL-GROOVING MACHINE

arranged that the cutting tool may be thrown out of operation part of the time, making it possible to cut grooves in the form of a cross, in a straight line parallel to the axis, or in the form of a half, whole or double spiral around the cylinder or bore. Another feature of the machine is that the taper bearings can be grooved. Fig. 1 is a back view of the machine while Fig. 2 is a cross-section showing the construction of the apparatus. The cam *A* transfers its motion to the shaft *B* through the follower, this shaft mounting two gear segments that are connected with the racks *C*. These racks are fastened to the slide *E*, which moves forward and back on the dovetail ways *D*, this motion serving to move the tool in and out of the cut at the desired points. To secure the longitudinal motion of the cutter, the block *J* that holds the toolpost is reciprocated in a longitudinal direction along the machine. Rigidly connected to the block *J* is the slide *F* that moves longitudinally in *E* and causes the block *J* and consequently the tool to be controlled by the cam mechanism.

To secure the feed for the tool, the feed screw *G* is provided, this being operated by means of a handwheel on a splined shaft *K* which slides in the feed screw *G* to allow the tool to be moved in and out of the cut. The top of the slide *E* can be swiveled, this feature allowing

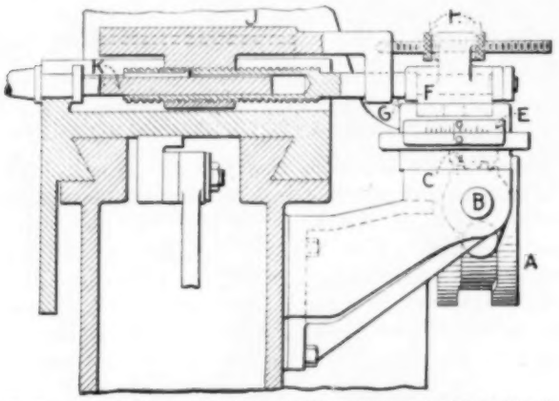
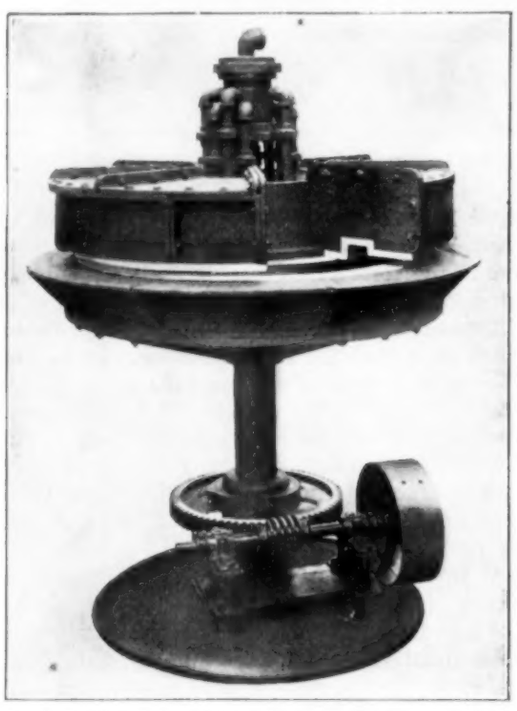


FIG. 2. A CROSS-SECTION VIEW OF THE MECHANISM

tapered work to be grooved. Another additional feature is the stop *H* that allows the tool to be brought back into the same position after being backed off for removing the bushing.

Standard Rotary End-Heating Furnace

The rotary end-heating furnace shown in the illustration is a recent product of the Standard Fuel Engineering Co., 1646 Woodward Ave., Detroit, Mich., and is intended for heating for hardening the ends of tools and other steel parts in which a local application of heat is desired. The lower part of the furnace body consists of a revolving table on which the pieces to be heated are to be laid, the ends projecting into the heating chamber. The operator stands in front of the furnace where one segment of the heating chamber is removed and deposits the pieces to be heated on the table and removes each piece as it emerges from the furnace after its rotary travel around the heating space. In the illustration the driving mechanism is shown at the front of the furnace in order to show its construction, but this is turned around to rear out of the way when the machine is in use. Small tools or other pieces of steel may be heated all over by placing them on that part of the hearth that travels through the heating chamber. The heating chamber itself has a vertical cross-section of 4 in. wide and 4¾ in. high, and the height of the opening through which the tools project into the furnace is 1¼ in. The height to the table is 36 in. and the outside diameter of the machine is 45 in.



STANDARD ROTARY END-HEATING FURNACE

Watching the Action of Drawing Dies

BY FRANK C. HUDSON

The illustration shows how the tool department of the Timken Roller Bearing Co. utilized a mirror to watch the action of sheet metal in new dies. A new sheet-metal cup is being drawn and the dies are set

NOVEL USE OF MIRROR IN TOOLROOM

in the small worm-driven screw-operated hand press shown on the bench, with a piece of metal between them.

Beneath the press is a small mirror at a suitable angle and in this the toolmaker watches the action of the sheet as it is forced down into the die. This shows the beginning of any wrinkles, shows exactly when and where they start, and gives an intelligent basis for correction, should this be necessary.

It is, of course, impossible to use this to advantage in all kinds of dies, but in such cases as this it has proved very helpful and has been found to have other applications.

Shipping Needs for Pan-American Trade*

By WALTER N. HURLEY
Chairman of the United States Shipping Board

IT IS under favorable auspices that we meet for the promotion of trade in the western world. Those familiar with the splendid work of the Pan-American Union have come to look upon it as a symbol of that amity and good will which so happily prevails between American nations, and as the efficient instrument by which international coöperation for mutual benefit along economic and social lines has been made really effective. To know that this union of American republics stands as sponsor for such a movement is to be assured of its progressive character, and to have a guarantee of its ultimate success.

This is a day for new beginnings in all fields of effort. The war has worked its profound changes in every country, and as peace opportunities beckon we have hardly time to pause and take our bearings before launching upon courses of action that will give a new bent to our customs and relationships. It is a time for caution, and also for the boldest initiative. On behalf of the United States Shipping Board, I invite your counsel and assistance in one of the greatest problems which confronts us at this time—that of restoring the broken lines of ocean transportation and of creating shipping facilities that shall be direct and adequate to the expanding needs of Pan-American trade.

To supply this trade, the need of ships is immediate and imperative—not tramps, with their uncertain sailings, indifferent accommodations, but liners, with definite sailings, offering direct connection between the chief ports.

Now that the war, with its interruptions of accustomed trade relations, is happily over, the keen desire of Latin-American merchants for the renewal of these broken shipping connections will be met by the United States Shipping Board, and there will be an improvement over the pre-war standard. Owing to this very interruption, exceptional opportunities will offer when ships of the right speed, size and type are established, as they soon will be, in direct liner service. Trade expansion is here to stay, and all forces seem to be pulling for the establishment of American shipping connections.

The United States Shipping Board is laying its plans to respond appropriately to this call. Already 226 ships, totaling 863,334 deadweight tons, have been allocated to Latin-American trade. What is more important, the Board is now surveying the situation in order to promote the establishment of regular American lines between the United States and South America. These will compare favorably with the former services of the European lines, and will even surpass them. Contemplated plans call for at least two lines from New York to serve the West Indian trades, one of them covering the eastern Caribbean and the other the western Caribbean with canal connections at Colon. To serve the swelling commerce of the West Coast, a line will be maintained connecting Valparaiso and the other western ports with Mobile or New Orleans. We have, today, a passenger service from New York to Valparaiso which is nine days shorter than existed one year ago, and as soon as the army returns our American transports, we will have weekly service from New York to Valparaiso on fine passenger liners through the Panama Canal.

Good liner service between Valparaiso and Seattle, with calls at all the important Pacific ports and also between San Francisco and New York, will be assured, and American lines already established in this field will be supplemented where required. Finally and most important, there will be a line from New York to the ports of Brazil and the River Platte. Modern ships of the passenger-cargo type operated over these lines will connect the great centers of trade, and to them will flow commerce from many intermediate points.

It is realized that nothing less than the best will serve to satisfy the demands of Latin-American travelers and exporters; therefore, no effort will be spared to make these liners conform to the highest standards of modern steamship service. It is hoped to have them specially designed for the South American trade and equipped with the convenience and luxuries which the long trips in tropical seas require. The passenger ships will have ample deck space, commodious lounging quarters, complete refrigerator systems to supply cool air in staterooms, and adequate bathing facilities. The 14 ships under consideration for these trades are of about 18,000 gross tons with a deadweight of about 12,000 and with accommodations for about 300 first-class passengers. Being combined freight and passenger ships, they can carry miscellaneous cargoes and will afford just the accommodations needed for the coffee merchant of Brazil who wants to take his own cargo to New York or New Orleans and who wishes to travel on the same ship with it.

Before the war the best ships in direct service from the United States to the eastern ports of South America made only 15 knots, offered only fortnightly sailings and took 24 days for the trip from New York to Buenos Aires. Compare this with the service to be expected in the immediate future. Three magnificent ex-German liners, the Mount Vernon, the Von Stueben, and the Agamemnon are to be remodeled for South American trade. These ships make 23½ knots, so that the trip from New York to Rio de Janeiro can be made in 10 days and that to the Argentine capital can be made in 14 days.

A very important benefit that will flow from the improvement of shipping connections with South America will be in the mail service. Poor mail facilities have, in the past, proved a serious handicap in the way of increased trade relations between the United States and Latin America. It is hoped that our Congress will change the laws governing carriage of mails so that practically every ship capable of making more than 12 knots an hour and clearing for South American ports will carry mail. By using both passenger and cargo lines, it will thus be possible to have mail service three or four times a week.

As things now stand, the mail between the United States and South America is carried in foreign ships with slow schedules, and this involves serious delays. After a letter is mailed it may wait two weeks before being put on a ship, and this ship will take 20 to 24 days to reach its destination. Thus it might take five weeks or at the best a month for a letter to go from New York to Buenos Aires. Under the new service, with fast ships sailing once a week and with intermediate sailings on slower vessels, a letter may be delivered on a fast ship in Buenos Aires 15 days after it leaves the writer's hands in New York. Within a month the New York correspondent may have a reply from Buenos Aires, while at present it takes about five weeks one way.

In the coming years, American shipyards must produce vessels swifter and finer than those to which the South American trades have been accustomed. South American steamship companies, as yet unborn, may build in North American yards the nucleus of South American fleets which in days to come will carry South American products to all quarters of the globe.

During the last few months, the Shipping Board's program of construction has been subjected to thorough revision so that the American fleet may be well balanced and may adequately serve the needs of peace times. In this revision, particular attention is being given to the peculiar needs of the liner service with the countries to the south.

Pan-Americanism is a vital factor in world peace. It is a movement solely for international coöperation and for mutual helpfulness. Unity of ideals has established bonds of friendship and confidence between the American peoples. These bonds of friendship and confidence have in turn laid the soundest possible foundation for trade. Therefore, we may go ahead with confidence in promoting our individual national interests, which also are our common national interests, by studying how best to serve one another's needs.

*From an address before the second Pan-American Commercial Conference, Washington, June 4, 1919.

Sparks from the

National Institute of Inventors Installs Officers

The installation of the officers of the National Institute of Inventors, 118 Fulton St., was held at the Broadway Central Hotel recently in the presence of 1000 guests and members. The newly elected officers, to serve until 1920, were: I. J. Wing, pioneer inventor of exhaust fans, president; Carl Schonert, manufacturer of automobile accessories, of Newark, first vice president; Robert C. Lafferty, architect, New York City, second vice president; George Julian Houtain, attorney at law, 44 Court St., Brooklyn, third vice president; Milton F. Williams, manufacturer of pulverizers, St. Louis, Mo., fifth vice president; W. H. Kennedy, recording secretary; Nathan Langer, treasurer; Paul Revere Fay, executive secretary, and R. Nerenstone, assistant executive secretary.

On the board of governors, to serve for five years, were elected: David Moss, New York City; L. Konner, New Orleans; Julius Glantz, New York City; Michael Quinano, Paterson, N. J.; J. M. Harding, New York City.

* * *

Tin Imports Permitted

Importations of pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals, and other metals containing tin may now be licensed, according to a ruling of the War Trade Board, subject to the following conditions and limitations: That such licenses will permit the importation only of shipments made from points of origin on and after June 30, 1919; and that such import licenses will not be valid for entry until August, 1919.

* * *

Resolutions Adopted at Conference on Business Training for Engineers

At the last session of the Conference on Business Training for Engineering Students and Engineering Training for Students of Business, held the week of June 23 at the Willard Hotel, Washington, D. C., the following are the resolutions which were unanimously adopted:

Resolved that it be the sentiment of this meeting that whereas: (1) Industrial and commercial development has created a demand for men with technical engineering training and business ability; manufacturing institutions are seeking engineers to qualify to serve in capacities requiring sound business training; banks and brokers also need men with engineering and business training; this need is rapidly increasing and bids fair to demand a large number of technically trained men for both foreign and domestic commerce. (2) To meet this demand, economic phases of engineering subjects should be emphasized wherever possible in engineering economics, cost accounting, business law, engineering curricula, etc. (3) Engineering phases of economic subjects should be emphasized wherever possible in comercial instruction. (4) It is also urged upon all institutions with departments in engineering and economics or commerce, that they consider some plan of coördination to develop a course in preparation for those careers wherein training and the essentials of engineering and business theory and practice have been found to be both helpful and necessary.

* * *

Billings & Spencer Company Insures Employees

Billings & Spencer Co., Hartford, Conn., has entered into a contract with the Travelers Insurance Co. to bring its employees under the protection of group life insurance.

Each person who has been in the employ of the company for three months is insured for $500. At the end of one year's services the amount will be raised to $750, and at the end of two years it will become $1000. After that it will be increased by $100 for each continuous year of service until the maximum of $1500 has been reached. The employees of Billings & Spencer number more than 1000.

Employment of Women on Railroad Work Decreases

Statistics compiled by the Railroad Administration show that steady reduction in the number of women employed by railroads is taking place as the result of demobilization and return of men to their old jobs. From a high mark of 101,785 women employees Oct. 1, 1918, the number had decreased Apr. 1 to 85,393. The first women to be let go were those engaged in heavy work in roundhouses and shops. In clerical occupations, where 72 per cent. of women were employed, small reduction has taken place.

THE NEW DINING ROOM OF THE CLEVELAND MILLING MACHINE COMPANY

* * *

Beneficiary Association Formed by Employees

Announcement has been made by the Doehler Die-Casting Co., Ninth and Huntington Sts., Brooklyn, N. Y. of the organization of a beneficiary association of its employees based on industrial democracy. The June issue of *Doehler Topics*, the factory monthly, contains the message of the president and general manager of the firm, H. H. Doehler, in outlining the plan of the association.

* * *

Steel Production

A Pittsburgh dispatch states that steel production is now at about 65 per cent. of capacity, against an average of 54 per cent. in May with a low point during the month of about 50 per cent., and averages of 65 per cent. and 77 per cent. in April and March.

World's Industrial Forge

By E.C.Porter, News Editor

Annual Meeting of the American Society for Testing Materials

The twenty-second annual meeting of the American Society for Testing Materials was held at Atlantic City, N. J., June 24 to 27, 1919. Without a doubt this meeting will be remembered as a most profitable one from the informative standpoint.

Each section of the meeting covered certain phases of the society's activities, among which were:

THE ACTIVITIES OF THE SOCIETY

On Preservative Coatings, Lubricants and Containers—This subject was supplemented by motion pictures showing certain activities of the U. S. Forest Products Laboratory, Madison, Wis., on the standardization of shipping containers. On Steel and Wrought Iron—J. A. Matthews gave a timely paper on "Modern High-Speed Steel." On Corrosion and Magnetic Analysis—Many interesting papers were presented on the retardation of corrosion of iron and steel and the function of magnetic analysis in determining the quality of steel, as well as the causes of failures in civil and mechanical engineering structures. On Testing and Apparatus; Rubber Products and Textiles—Results of researches which have been going on for some time were given at this session. Two interesting papers, "A Fatigue Testing Machine," by F. M. Farmer, and "The Single Blow Notch Bar Impact Test as Used in the American Industry," by E. H. Dix, were presented. Mr. Dix offered suggestions for the improvement in the present notch bar impact testing machines and advocated the adoption of these machines as a general plant control proposition. Changes in the specifications for various rubber products and textiles were also discussed.

HOLDS A JOINT SESSION

Malleable Iron and Non-Ferrous Metals; Ceramics, Lime and Road Materials; and Concrete Gypsum, were amply covered in other sessions. The meeting closed with a joint session with the American Concrete Institute at which the latest practices in the use of cement and concrete were gone over.

* * *

The American Society of Mechanical Inspectors Publishes a Magazine

The American Society of Mechanical Inspectors, which was formed last winter for the furtherance of mechanical inspection, has published the first issue of its official monthly publication, *The Inspector*. The editor and manager is Henry F. Winter, A. E., and the contributive editors are Guy H. Vaughn, John B. Thomas, Herbert L. Bailey, H. Ream Baker and Harry M. Spitzenberg.

Some of the articles in the first issue of *The Inspector* are: "The Use of Gage Block in Inspection," by Ernest Mentor; "U. S. Bureau of Standards of Measuring Millionths," by H. S. Bean; "Productions from the Inspector's Viewpoint," by John B. Thomas.

The editor states that it will be the policy of *The Inspector* to present only educational articles written by representative authorities. It will not attempt to use highly technical phraseology, but will confine itself to impart practical and technical knowledge in an understandable manner.

* * *

New General Offices and Laboratory

Ground has been broken in Detroit for the new office building of the General Motors Corporation. The structure will cover a city block and upon its completion the general offices of the concern will be moved from New York to Detroit. In addition to the offices which will be located in the main portion of the building, there will be a research and experimental laboratory at the rear in a five-story fireproof wing, with floor space 180 x 300 ft. This will probably not supplant the laboratories at the various plants of the corporation, but will act as a clearing house and central research station to coördinate and systematize the work of the different laboratories.

* * *

To Establish Farm Machinery Plants in Mexico

A Mexican government official just returned from the United States says that several large manufacturers of farm machinery in the United States have decided to establish branch offices and plants in Mexico. Motor trucks and tractors were mentioned as two of the commodities that will meet with readiest sale and adaptation in the Republic.

* * *

Buys U. S. Machine Tools

La Construction Metallique de Belgique, according to a Reuter dispatch from Brussels, has purchased from the United States army all the machine tools it used in France. The prices to be paid will be those of 1914, increased by about 55 per cent. The buyers of the tools, it is added, will have credits for three years at a moderate rate of interest. These terms, however, will apply only to goods used to replace those taken by the Germans.

Market Letter from Chicago

Judging by the first half of the year just closed, 1919 bids fair to be an excellent year for the machine-tool business in the Chicago territory. The excellent business reported in recent letters continues on all sides. With but three exceptions, dealers report June better than May, and practically all say that the first six months of the year are better than the corresponding period in 1917.

DEALERS' STOCKS DEPLETED

Ordinarily, with the advent of hot weather a decided slump occurs, but such has not been the case this year. Rapid buying has depleted dealers' stocks until many lines are exhausted, and manufacturers are so busy that on the more popular items, deliveries are now ranging from 30 days to six months. A large manufacturer of drills, near Chicago, reports the largest output of his plant in June, and there are more orders on his books than ever before. From all sides are reported plants running 16 hr. daily, and in one or two instances, 24.

LATHES BEING SOLD RAPIDLY

Sales are still limited to comparatively small orders, or rather, to orders from the smaller corporations, the big fellows still seeing fit to stay out of the market. One sale worthy of mention was of 20 punch presses of one size. Another concern has ordered seven. Lathes, which for some time were very slow moving, are again being sold quite rapidly. Numerous sales of large boring machines and milling machines are noted.

No purchases have been made as yet on the lists of tools required by the Worthington Pump Co. or the Pneumatic Tool Co., and many of the items specified by the Studebaker Corporation are still open. There is a feeling in the trade that these are but the opening items of a long line of large purchases.

* * *

Railroad Demurrage Charges Reduced

Walker D. Hines, director general of railroads, has announced a reduction in demurrage charges to take effect on July 20. For detaining cars, either loaded or empty, the charge will be $2 per day for each of the first four days and $5 a day for each succeeding day. The new charges compare with present charges of $3 a day for each of the first four days, $6 a day for each of the next three days and $10 a day thereafter. Heretofore, however, no charge has been made for cars detained for loading.

Personals

J. P. COMMENTZ, industrial engineer of the Wright-Martin Aircraft Corporation, Long Island City, N. Y., has been appointed assistant plant engineer at the U. S. A. E. Plant, Long Island City, N. Y.

ALFRED CROOK, vice president and general manager of the Philadelphia Roll and Machine Co. and the Tioga Steel and Iron Co., also of Philadelphia, has returned from Europe where he has been for several months engaged in investigating foreign-trade conditions in the interests of the above companies, which are subsidiaries of the Taylor-Wharton Iron and Steel Co., High Bridge, N. J., of which Mr. Crook is also a vice president.

Trade Catalogs

Air-Operated Chucks and Operated Countershafts. Hannifin Manufacturing Co., Chicago, Ill. This is a 63-page, illustrated catalog of the "Hannifin" products, giving specifications and sizes and will be sent to interested parties upon request.

Wetmore Expanding Reamers. Wetmore Reamer Co., Milwaukee, Wis. Bulletin No. 11 includes illustrations, descriptions, dimensions and prices of Wetmore reamers, its parts, arbors, blades, etc.

Caterpillar Tractor. Holt Manufacturing Co., Peoria, Ill. Catalog No. C-121, describing what the caterpillar tractor did in the World War. Complete specifications are given of the caterpillar tractor.

Wallace Improved No. 5a Pipe-Bending Machines. Wallace Supplies Manufacturing Co., Chicago, Ill. The "Wallace" machines are illustrated and described briefly in this catalog, which also contains a price list.

Fans and Blowers. Buffalo Forge Co., Buffalo, N. Y. It is a valuable catalog to those interested in fans, blowers and exhausters giving tables of dimensions, specifications of the Buffalo exhauster and price list.

Bench Lathes and Attachments. S. A. Potter Tool and Machine Works, New York City. Catalog No. 9, illustrating the accuracy and strength of its bench lathes and attachments, and also describing how it has been perfected.

Gunite Book No. 6. Cement Gun Construction Co., Chicago, Ill. This illustrated booklet shows the use of "Gunite" for repairing defective masonry, protecting rock cuts and embarkments; also for protecting steel against corrosion.

Introducing "The Message of Efficiency." Robbins, Gamewell & Co., Pittsfield, Mass. An interesting booklet showing the development of its machine-tool department, which was open in 1915 for war work, but is now on a permanent basis; it illustrates different departments in the shop. A copy of this booklet will be sent to any one interested in construction work.

Oxy-Acetylene-Welding Supplies. K. G. Welding and Cutting Co., 556 West 34th St., New York. A circular, giving a brief description of welding supplies, such as steel wire for plate welding, brass wire, Tobin bronze rods and kerosene preheating torches; also sizes that can be made to order.

Apparatus and Applications. Massachusetts Blower Co., Watertown, Mass. A condensed bulletin which is designed to present a convenient form of general data on its various products. Dimensions, power requirements and other details for specific installations will be supplied by its engineering department upon request.

Fuel Oil. Tide Water Oil Co., New York. Booklet, 6 x 9 in., pp. 46. It contains formulas for computing the relative cost of fuel vs. coal, comprehensive data on the instruments, tanks and other appliances necessary for its most efficient use. The booklet is intended to be of service not only to the non-technical executive and plant managers, but also to the plant engineer. It is sent without charge to engineers, managers, plant owners, etc.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A manufacturer in Argentina desires to purchase machinery and accessories necessary to install a plant for the manufacture of oleomargarine. Terms, cash against documents at destination. Correspondence should be in Spanish. References. No. 29,669.

The purchase of machinery for the manufacture of porcelain insulators is required by a manufacturer in Brazil. Specifications of the machinery required and illustrations of the articles to be manufactured were forwarded and may be examined at the Bureau or its District Offices. Correspondence should be in Portuguese, Spanish or French. References. No. 29,666.

Woodworking machinery is required by a man in Italy. Correspondence should be in Italian. References. No. 29,678.

A company in England, having recently established an office in this country, desires to communicate with manufacturers of machinery, electrical goods, motor cars and accessories. Reference. No. 29,663.

Electrical machinery and supplies are required by an industrial corporation in Italy. Correspondence may be in English. References. No. 29,604.

The purchase of lathes, machine tools to be supplied to coal mines and arms factories, and compressed-air drills for coal mines, is desired by an importing firm in Belgium. Correspondence and catalogs should be in French. No. 29,649.

An agency is desired by a business man in England for the sale of machinery, machine tools, machine-shop and foundry supplies and metals; also timber, paints and oils. No. 29,659.

A firm in Italy wishes to secure an agency for the sale of machinery, tools, accessories, electrical goods and construction materials. Correspondence may be in English. References. No. 29,625.

The purchase and agency for the sale of wood and metal-working machinery, gasoline and heavy oil engines, 2 to 20 hp., are required by a man in Italy. Correspondence should be in Italian. Reference. No. 29,681.

A firm in Brazil desires to purchase electrical materials of all kinds, such as wire cables, insulators, sockets, globes, plugs, fuses, switches, and interrupters. A list and description of the supplies required was forwarded and may be examined at the Bureau or its district offices. (Refer to file No. 117,955.) Correspondence should be in Portuguese. References. No. 29,682.

LEON K. PAROUNAGHIA, 86 Rue d' Eglise Makeikeny, Constantinople, Turkey, a mechanical and electrical engineering graduate from Ecole Polytechnique, Paris, has opened an office at Constantinople, Turkey, and is anxious to get in touch with electrical and mechanical corporations.

New Publications

The A-B-C of Cost Engineering. By Robert S. Denham. One hundred and four 4 x 6-in. pages, bound in light cloth boards. Published by the Denham Costfinding Co., Cleveland. Sent free to factory executives.

The author's object is to make it possible for the busy executives in manufacturing enterprises to grasp in the least possible time, the principles of up-to-date methods for determining the cost of producing and selling the products of their factories. The principal chapters deal with: The Mysteries of Cost; What Is a Cost System; Cost Engineering; Getting the Cost of the Order, or Lot; Records as a Basis for Estimating; Auxiliaries of the Cost System; System and Red Tape; The Comittee-Made "Uniform Cost System," and the Commercial Cost Engineering Service.

How to Understand the Reading of Blueprint Drawings. By Edward R. Vigneau. One hundred and sixty-nine 5 x 7½-in. pages containing 223 illustrations. Published by the Educational Institute, 100 Rowland Blog., Detroit, Mich. Price, $2.

This little book will be welcome to those who wish to learn about the reading of drawings, blueprints and perspectives. The explanations and arrangements of the examples are put in such a way that the beginner or the more advanced learner will find them easy to follow. The various chapter headings are: The Elements of Blueprint Drawings; Elevations; Distinction Between Views, Elevations and Plans; Different Number of Details in Blueprint Drawings; Angle Projections; Cross-Sections; Assemblies; Miscellaneous in Blueprint Drawings; Conventions.

Forthcoming Meetings

American Foundrymen's Association. Annual convention and exhibit will be held in Philadelphia the week of Sept. 29, 1919. C. E. Hoyt, secretary, 111 W. Monroe St., Chicago, Ill.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Electric Hoist Manufacturers' Association. Monthly meetings at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary, W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month, with the exception of July and August. Lewis H. Kenney is the chairman of committee on papers.

Engineers' Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

The International Railroad Master Blacksmith's Association will hold its annual convention in Chicago Aug. 19, 20 and 21. The location of the meeting in Chicago will be announced later.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

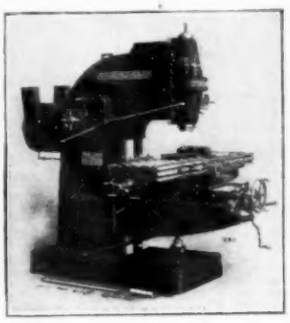
Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut is the secretary, 1735 Monadnock Block, Chicago, Illinois.

Condensed-Clipping Index of Equipment

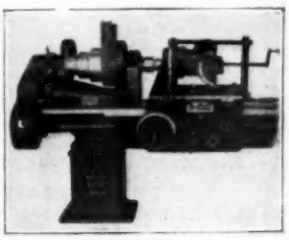
Clip, paste on 3 x 5-in. cards and file as desired

Milling Machine, No. 4, High-Power, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
"American Machinist," June 26, 1919



Made particularly for heavy-duty work, the chief features being a gear-driven head and the intermittent feed feature by which the working feeds and rapid traverse are dog controlled, eliminating much waste time. Size of table, 19 in. wide, 68 in. long, with three ¾-in. T-slots; driving pulley, 16 in. in diameter for 5-in. belt, running 600 r.p.m.; rapid traverse for cross and vertical adjustment, 30 in. per minute; rapid traverse of table feed, 100 in. per minute; capacity of centrifugal lubricant pump, 11 gal. per minute; weight, 9500 lb.

Cylinder-Boring Attachment for Lathes
South Bend Lathe Works, 425 East Madison St., South Bend, Ind.
"American Machinist," June 26, 1919

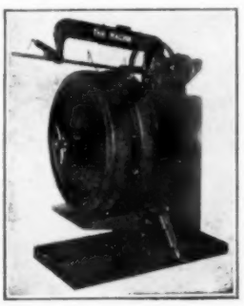


Applicable to lathes of 15 in. or larger. In putting the attachment in place, the compound rest is removed from the saddle, the jig being secured in position by means of two taper pins and bolts fitting the T-slots in the carriage. There is a hole in the attachment in line with the lathe spindle. This hole is fitted with a removable bushing which is in its turn fitted with a plug, on the end of which a shoulder is turned of the same size as the cylinder bore. This bushing and plug are put in place with the end of the plug projecting through. The cylinder is placed over this plug and clamped in place, after which the plug and bushing are removed, allowing the work to be done.

Saw, Roll-Chill-Slot
Racine Tool and Machine Co., Racine, Wis.
"American Machinist," June 26, 1919

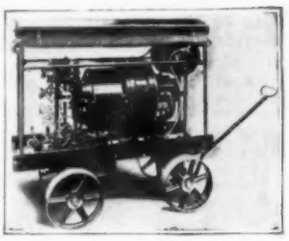
For use on one type of chill used in the casting of chilled-surface rolls, consisting of a water-cooled jacket or ring, around the inner circumference of which are a number of cored slots to provide for expansion when the ring is heated by the molten metal. After the chill has been machined, it is the practice to saw through from the inside into the slots to provide for expansion. Weight, 2500 lb.; height over all, 64 in.; floor space with belt drive, 40 x 31 in.; driving pulley on belt-driven machine, 12 x 2¾ in.; speed, 90 strokes per minute; blade, 14 in. long; belt, 6 in.; motor recommended for motor drive, ¾ hp.; size of chills handled, inside diameters from 20 to 33 in. with maximum outside diameter of 50 in.; movement of upper rollers, 14 in.

Saw, Tire
Racine Tool and Machine Co., Racine, Wis.
"American Machinist," June 26, 1919



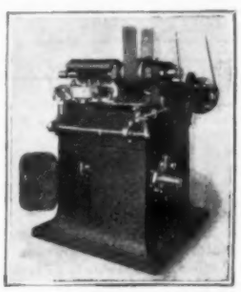
For removing the steel rims of worn-out truck tires from the wheels. The saw mechanism is mounted on a sturdy base provided with a platform that may be raised or lowered by a ratchet-lever-driven worm, operating a gear in mesh with a rack cut in the base. Weight, 1077 lb.; floor space, 24 x 48 in.; distance from top of platform to bottom of blade with platform in lowest position, 44 in.; height of machine from floor to top frame, 5 ft.; blades used, up to 24 in. long and up to 1 in. wide; travel of platform, 14 in.; height of platform above floor when in lowest position, 4 in.; coolant used and circulating pump provided; diameter of drive pulley, 16 in.; face of drive pulley, 4 in.; speed, 100 strokes per minute.

Welding Outfit, Electric Arc
U. S. Light and Heat Corp., Niagara Falls, N. Y.
"American Machinist," June 26, 1919



For shops where it is practicable to bring the parts to be welded within 50 or 75 ft. of the welding apparatus, a stationary type is provided, but where the work cannot be moved, a light-weight portable machine is furnished that may be taken direct to the work. With a rated capacity of 4 kw., this gives 200 amperes direct current or less, with an arc voltage of 17 to 22 volts, and an open-circuit voltage of 35 to 65 volts. It is made in the form of a converter for use on 100- to 125-volt direct-current circuits only, and in the form of a motor generator for all other alternating or direct-current circuits. The converter set weighs 665 lb. and delivers current to the arc through the arc-stabilizing reactor with an efficiency of 65 to 70 per cent. The motor-generator type consists of a 7½-hp. motor, mounted on the same shaft with a 4-kw. welding generator.

Milling Machine, Semi-Automatic
F. C. Sanford Manufacturing Co., 2060 Fairfield Ave., Bridgeport, Conn.
"American Machinist," June 26, 1919

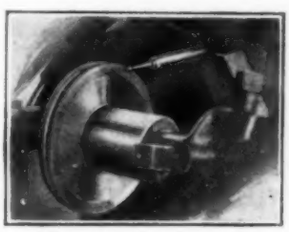


For the milling of valve heads, locknuts or work of a like nature, and has a sliding head which carries the arbor, which in turn carries a gang of six side-cutting mills. The table consists of a chuck having six sets of jaws. To operate the machine the operator places the work in the first set of jaws. At the end of the reverse stroke, the chuck or table turns one-sixth of a circle and automatically locks. The head advances and No. 1 hub is faced on two sides by cutters No. 1 and No. 2. On the second stroke, the table has made another one-sixth of a full turn and the second two sides of No. 1 hub are milled by cutters No. 3 and No. 4, as well as the first two sides of hub No. 2. With the third stroke, the table has made its full half turn and the last two sides of hub No. 1 are completed, the second two sides of hub No. 2 and the first two sides of hub No. 3.

Milling Cutters with Brazed-In Blades, "Economy"
H. H. Arnold Co., Rockland, Mass.
"American Machinist," June 26, 1919

High-speed steel blades are used, and these are united to the tough alloy-steel body by a brazing process. Made at present in sizes from 3 to 8 in. in diameter, with widths from ¼ to 1¼ in. The blades are undercut and backed up by the tough-body stock, and ample chip space is provided. The body material is machinable and the flutes are easily remilled when the blades are worn down, thereby maintaining the correct land and chip space during a longer period than would be possible with a solid cutter. Another feature is that the holes can be rebored, and keyed to fit arbors of larger size if this should at any time become necessary. Also special markings for records are easily stamped on the body.

Wiggler
Boston Tool and Manufacturing Co., Inc., 262-280 Dover St., Boston, Mass.
"American Machinist," July 3, 1919



The illustration shows a wiggler for use on milling- and drilling-machine work. The device consists of a cylindrical body, carrying in one end the movable pointer, and is shown in the illustration in use on a milling machine. The device will give the true center of the spindle quickly, enabling the rapid laying out of positions for holes on surfaces, etc.

Patented Aug. 20, 1918

The Weekly Price Guide of

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co., as per Department of Commerce Committee Schedule.

CINCINNATI	
No. 2 Southern	$29.80
Northern Basic	27.55
Southern Ohio No. 2	28.55
NEW YORK—TIDEWATER DELIVERY	
Penna. 2X	31.90
Virginia No. 2	31.15
Southern No. 2	33.95
BIRMINGHAM	
No. 2 Foundry	25.75
PHILADELPHIA	
Eastern Pennsylvania No. 2	30.65
Virginia No. 2	30.85
Basic	29.90
Grey Forge	29.90
Bessemer	31.85
CHICAGO	
No. 2 Foundry local	27.25
No. 2 Foundry, Southern	31.75
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY	
No. 2 Foundry	28.15
Basic	27.15
Bessemer	29.35

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$4.07	$4.20	$3.37	$4.20	$3.47	$4.20
Soft steel bars	3.37	3.97	4.10	3.27	4.20	3.37	4.10
Soft steel bar shapes	3.37	3.97	4.10	3.27	4.20	3.37	4.10
S ft steel bands	4.07	4.57	....	....	....	....	....
Plates, ¼ to 1 in. thick	3.67	4.27	4.45	3.57	4.20	3.67	4.45

*For ⅜-in. plates the extra is 30c. per 100 15.
Note—For less than carload lots add 4½c. per 100 lb.

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill, Eastern shipment	$2.75	$3.50
Warehouse, New York	3.37	4.70
Warehouse, Cleveland	3.22	4.10
Warehouse, Chicago	3.37	4.10

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
*No. 28 black	4.35	5.37	5.62	6.45	5.27	6.385	5.37	6.45
*No. 26 black	4.25	5.27	5.52	6.35	5.17	6.285	5.27	6.35
*Nos. 22 and 24 black	4.20	5.22	5.47	6.30	5.12	6.235	5.22	6.30
Nos. 18 and 20 black	4.15	5.17	5.42	6.25	5.07	6.185	5.17	6.25
No. 16 blue annealed	3.75	4.77	4.77	5.65	4.67	5.585	4.77	5.65
No. 14 blue annealed	3.65	4.67	4.67	5.55	4.57	5.485	4.67	5.55
No. 10 blue annealed	3.55	4.57	4.57	5.45	4.47	5.385	4.57	5.45
*No. 28 galvanized	5.70	6.50	7.42	7.70	6.62	7.635	6.72	7.70
*No. 26 galvanized	5.40	6.20	7.12	7.40	6.32	7.335	6.42	7.40
No. 24 galvanized	5.25	6.05	6.97	7.25	6.17	7.185	6.27	7.25

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gage; for galvanized corrugated sheets add 15c.; all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List	List plus 10%
Cleveland	5% off	List plus 10%
Chicago	2% off	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	45%	40%
Cleveland	35%	35%
Chicago	35%	35%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$25.50–30	$15.00
Cleveland	20.00	15.00
Chicago	16.50	15.00

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
1, 11, ⅞, ¾, ⅝, ½ No. 8, ⅜ and No. 10	25.50 to 33.00	⅜ by 12 in. long	14.00
⅞		⅜ by 19 in. long	12.00
No. 12		½ by 19 in. long	10.00
⅜, No. 14 and 5/16		½ by 21 in. long	10.00
No. 18		Special Welding Wire, Coated	
No. 20		⅛	33.00
Domestic 20c. for 1/16, 15c. for ⅛ to ⅜		5/32	30.00
		1/16	58.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	8.00
Spring steel (light)	10.00	11.25	11.75
Coppered bessemer rods	8.00	8.00	7.07
Hoop steel	4.07	4.75	4.07
Cold-rolled strip steel	7.50	8.25	8.10
Floor plates	5.67	6.00	5.92

Note—For less than carload lots add 4½c. per 100 lb.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardiy A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	50½%	24%	⅛ to 1¼	39½%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	55½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	½ to 1¼	39½%	24½%
½	51½%	39%			
¾ to 1¼	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35½%	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stock discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
⅛ to 3 in. steel butt welded	47%	31%	46½%	31 %	57½%	44%
3½ to 6 in. steel lap welded	42%	27%	42½%	27½%	53½%	41%

Malleable fittings. Class B and C, from New York stock sell at list +12½%. Cast iron, standard sizes, 10% off.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.00	15.37½	23.50
Tin in 5-ton lots	70.50	72.50	91.00
Lead	5.40	5.25	7.25
Spelter	7.45	6.05	7.62½
ST. LOUIS			
Lead	5.15	5.00	7.12½
Spelter	7.10	6.20	7.31½

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Copper sheets, base	27.50	22.50	31.50–33	28½–29½	35.00	27.00	31.50
Copper wire (carload lots)	24.00	23.00–28	32.00	26.50	34.00	23.00	31.00
Brass sheets	23.00	23.75–28	30.75	27.00	30.00	21.50	30.00
Brass pipe	34.00	34.00–37	36.50	35.00	41.00	31.00	40.00
Solder (half and half) (case lots)	45.00	46.50–41	62.00	41.00	41.25	39.00	55.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extras:

	Current	One Year Ago
Mill	$20.00	$25.25
New York	21.50	26.25
Cleveland	26.00	30.00
Chicago	24.00	28.00

Shop Materials and Supplies

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f. o. b. mill 11.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	12.95	18.50	13.30	18.40
New York	12.00	16.50	13.00	17.00
Chicago	16.50	21.00	16.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	8.37½	13.00
Chicago	10.00	13.00
Cleveland	10.03	16.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy and crucible	16.00	22.00	16.30	29.00	16.50
Copper, heavy and wire	15.00	21.00	16.00	28.00	15.75
Copper, light and bottoms	13.00	19.00	14.00	24.00	14.25
Lead, heavy	4.62½	6.25	4.75	6.00	4.75
Lead, tea	3.75	5.00	3.50	5.00	4.00
Brass, heavy	9.50	14.25	10.50	18.00	16.00
Brass, light	7.75	10.50	8.25	14.00	9.00
No. 1 yellow brass turnings	8.50	12.50	8.50	19.00	9.00
Zinc	4.25	5.25	4.50	5.50	5.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (1-15 ton lots), per lb.	37c.-39c.	32.00c.	33½c.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	25.00	36.00
Chicago	28.00	36.00
Cleveland	28.50	35.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	87.00	125.00	79.00	100.00	75.00	113.00
Commercial	42.00	70.00	17.50	22.00	15.00	23.00

SHOP SUPPLIES

New York prices will be revised in next weeks issue.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$1.28	$1.05	$1.90	$1.40	$2.00	$1.05
Hot pressed hexagon	1.08	.85	1.90	1.20	2.00	.85
Cold punched hexagon	3.25	1.00	1.90	.75	1.30	1.00
Cold punched square	2.70	1.00	1.90	.75	1.30	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50-10%	40%
Chicago	50%	50%
Cleveland	60-10-10%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	50–10%	50%	50–10%
Larger and longer up to 1¼ in. by 30 in.	40–10%	40%	40–10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York.....$1.25 Cleveland.....$3.50 Chicago.....$2.25

For cast-iron washers the base price per 100 lb. is as follows:

New York.....$6.00 Cleveland.....$3.75 Chicago.....$4.00

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
¾ by 6 in. and smaller	50–10%	40–5%	50%
Larger and longer up to 1 in. by 30 in.	45–5%	37½%	50–5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	25%	List plus 10%	10%	List plus 10%
Chicago	10%	List price	10%	List price
New York	40%	20% from list	20%	10½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	65%	60–5%	45%
Tinned	65%	60–5%	40%

Boiler, ¾, ⅞, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:

New York...$4.72 Cleveland...$4.00 Chicago....$4.87 Pittsburgh...$4.65

Structural, same sizes:

New York...$4.82 Cleveland...$4.10 Chicago....$4.97 Pittsburgh...$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	29.00	35.00	32.00
Brass	28.00	35.00	31.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., the advance is 5c. over base (100-lb. lots); for less than 50 lb., but not less than 25 lb., 10c. should be added to the base price; and for quantities of from 10 to 25 lb. the extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet-metal mouldings if ordered in above quantities. The above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛ up to 2 in. inclusive in rounds, and ½ up to 1½ in., inclusive in square and hexagon—all varying by thirty-seconds up to 1 in. and by sixteenths over 1 in. On all shipments aggregating less than 100 lb. there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	13.00	11.00–13.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13¼ x 13¼	13½ x 20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.75	2.75	2.35
Chicago	2.00	2.00	2.25

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.65	$3.65	$4.30
Cleveland	3.62	3.62	4.50
Chicago	4.12½	4.50	4.75

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	July 3	June 24	June 17	June 10	June 3
Prompt furnace	$4.25	$4.00	$4.00	$4.00	$4.00
Prompt foundry	5.00	4.50	4.50	4.50	4.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	per ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.98	$1.61	$2.15	$1.70	$2.16	$1.66
5-gal. cans	2.11	1.71	2.40	1.85	2.36	1.86

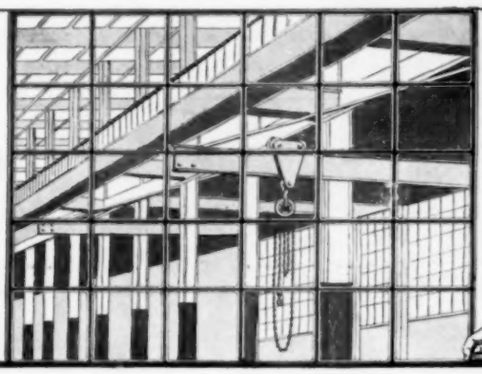
WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	13.00	14.50	11.25	11.00	13.00	10.50
25 and 50-lb. kegs	13.25	14.75	11.50	11.25	13.25	10.75
12½-lb. keg	13.50	15.00	11.75	11.50	13.50	11.00
5-lb. cans	15.00	16.50	13.25	13.00	15.00	13.00
1-lb. cans	16.00	17.50	13.25	13.00	16.00	13.00

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies



Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The city plans to build a 2 story garage, stable and storage building at Seaside Park. Estimated cost, $50,000. E. G. Southey, 983 Broad St., Arch.

Conn., Bridgeport — The Schwerdtle Stamp Co., 41 Common St., manufacturer of dies, plans to build a 3 story, 30 x 60 ft. factory. Estimated cost, $25,000.

Conn., New Haven—M. Massari, 142 Bradley St., plans to build a 1 story, 55 x 86 ft. and 16 x 48 ft. garage. Estimated cost, $25,000. R. W. Fabian, Arch.

Conn., New Haven—N. B. Whitfield, 296 Elm St., plans to build a 1 story, 60 x 220 ft. garage, sales and service station on Broadway. Estimated cost, $50,000. R. W. Foote, 185 Church St., Arch.

Conn., New London—M. A. Avery, 176 Main St., has awarded the contract for the erection of a 2 story, 80 x 101 ft. garage. Estimated cost, $50,000. Noted Apr. 10.

Conn., New London—The Raymond & Alexander Lumber Co., Howard Ave. and Hamilton St., will build a 1 story, 80 x 113 ft. garage. Estimated cost, $24,000.

Conn., Waterbury—The city is having plans prepared by C. Gilbert, 244 Madison Ave., New York City, for a 1 story garage. Estimated cost, $60,000. Noted Apr. 24.

Conn., Waterbury — The Simonsville Manufacturing Co., Pearl Lake Rd., manufacturer of metal specialties, plans to build a 1 and 2 story, 40 x 166 ft. factory on Madison Ave. and Baldwin St. Estimated cost, $30,000. F. A. Webster, 51 West Main St., Arch.

Conn., Winnipauk (Norwalk P. O.)—The Clover Manufacturing Co., Day St., South Norwalk, manufacturer of hardware specialties, has awarded the contract for a 1 story, 60 x 465 ft., a 1 story, 90 x 300 ft. and a 1 story, 40 x 60 ft. factory buildings to be erected here. Estimated cost, $200,000.

Mass., Boston—A. S. Knight et al, 309 Sears Bldg., has awarded the contract for a 1 story, 90 x 233 ft. garage and service station, to be erected on West Dedham St. Estimated cost, $75,000.

Mass., Springfield—J. Weisenberg, 112 Evereet St., has awarded the contract for a 1 story, 105 x 143 ft. garage, to be erected on Howard St. Estimated cost, $40,000.

Mass., Worcester—P. J. Downey, 21 Curtis St., plans to build a garage and service station. Estimated cost, $20,000. E. P. Fitzgerald, 340 Main St., Arch.

R. I., Central Falls—The Hemphill Manufacturing Co., 131 Clay St., manufacturer of knitting machines, has awarded the contract for a 2 story, 38 x 153 ft. factory with a 25 x 48 ft. ell and a 1 story, 38 x 189 ft. forge shop. Estimated cost, $65,000.

R. I., Providence—The Atlantic Refining Co., 503 Turk Heads Bldg., has awarded the contract for a 1 story, 30 x 40 ft. garage, a 14 x 14 ft. service station and a 1 story, 40 x 100 ft. storehouse, to be erected on Elmwood Ave. Estimated cost, $25,000.

MIDDLE ATLANTIC STATES

N. J., Elizabeth—The Singer Manufacturing Co., Singer Bldg., New York City, manufacturer of sewing machines, has awarded the contract for a 3 and 4 story, 176 x 252 ft. foundry, to be erected here.

N. J., Trenton—J. E. Thropps Sons Co., Lewis St., has awarded the contract for the erection of a 2 story machine shop. Estimated cost, $65,000.

N. Y., New York (Borough of Bronx)—C. Dahlen, 341 East 142nd St., will build a 2 story, 50 x 95 ft. garage, on East 173rd St. Estimated cost, $25,000.

N. Y., New York (Borough of Bronx)—A. Guidone, 52 Vanderbilt Ave., New York City, will build a 1 story, 100 x 100 ft. garage on Harlem River Terrace near Fordham Rd. Estimated cost, $25,000.

N. Y., New York (Borough of Bronx)—F. P. Vacarelli, 1475 Broadway, New York City, will build a 1 story, 60 x 155 ft. garage on Quarry Rd., near 3d Ave. Estimated cost, $25,000.

N. Y., New York (Borough of Bronx)—W. J. Wilgin, 165 Broadway, New York City, will build a 1 story, 75 x 100 ft. garage, on 149th St. and Park Ave. Estimated cost, $155,000.

N. Y., New York (Borough of Brooklyn)—A. Paolella, 810 4th Ave., will build a 1 story, 22 x 41 x 76 x 102 ft. garage on 27th St. and 4th Ave. Estimated cost, $45,000. Noted Mar. 6.

N. Y., New York (Borough of Manhattan)—H. S. Coffin, 44 Pine St., will build a 2 story, 99 x 188 ft. garage at 388-94 11th Ave. Estimated cost, $100,000. Noted June 5.

N. Y., New York (Borough of Manhattan)—The J. Hoffman Brewing Co., 211 East 55th St., is having plans prepared by A. Baylies, Arch., 33 Bible House, for altering its 3 story brewery into a garage and building an addition to same.

N. Y., New York (Borough of Queens)—S. Blickman, 199 Lafayette St., New York City, manufacturer of heavy sheet metal, will build a 6 story, 132 x 200 ft. factory on Nott, Manby, Anable and Mount St., Long Island City. Estimated cost, $400,000. Noted May 29.

N. Y., New York (Borough of Richmond)—V. Perose, 275 Morningstar Rd., Port Richmond, will build a 1 story, 50 x 105 ft. garage on Prospect St. Estimated cost, $25,000.

Penn., Homestead — The Homestead Foundry Co. has awarded the contract for the erection of a foundry.

Penn., Philadelphia—B. F. Heal, 1803 North 19th St., will build a 2 story, 54 x 101 ft. garage. Estimated cost, $10,000. E. C. Durell, 1713 North 24th St., Arch.

Penn., Philadelphia—C. Korn, 2536 West Girard St., has awarded the contract for the erection of a 1 story garage. Estimated cost, $12,500.

Penn., Pittsburgh—The Dilworth-Porter Co., 4th and Bingham St., has awarded the contract for a 1, 2 and 3 story, 110 x 250 ft. machine shop, foundry, forge shop and storage building, to be erected on 6th and Bingham St. Estimated cost, $110,000.

Penn., Pittsburgh—A. W. Mellon will build a 2 story, 50 x 120 ft. garage on Baum Blvd. Estimated cost, $35,000. Keystone Buick Co., Lessee. T. Pringle, 410 Oliver Ave., Arch.

Penn., Pittsburgh—The Singer Nimick Plant of the Crucible Steel Co. of America, West Carson St., has awarded the contract for alterations to its plant. Estimated cost, $150,000.

Penn., Pittsburgh—The Wolverine Supply and Manufacturing Co., Page and Fontella St., manufacturer of automatic toys, will build a 4 story, 75 x 100 ft. factory. Estimated cost, $125,000. Hunting-Davis Co., Century Bldg., Arch. Noted May 1.

SOUTHERN STATES

La., Baton Rouge—The Aluminum Ore Co., East St. Louis, Ill., has acquired a 227 acre site near here and plans to build an aluminum ore refinery. Estimated cost, $1,000,000. C. E. Rudisill, c/o owner, Engr.

W. Va., Huntington—The Summers-Buick Co. will build a 3 story, 45 x 165 ft. garage and showroom on 4th Ave. and 5th St. Estimated cost, $30,000.

MIDDLE WEST

Ill., Chicago—The Ilg Electric Ventilating Co., 154 Whiting St., manufacturer of fans, blowers and ventilating apparatus, is having preliminary plans prepared by A. S. Alschuler, Arch., 28 East Jackson Blvd., for a 4 story factory and several other buildings, to be erected on Crawford Ave. and George St. Estimated cost, $750,000. Noted Feb. 20.

Ill., Chicago—The Pettibone-Milliken Co., 725 Marquette Bldg., has awarded the contract for the erection of a steel foundry. Estimated cost, $200,000.

Ind., Indianapolis—Nordyke & Marmon, 250 North Meridian St., manufacturer of mill machinery and automobiles, has awarded the contract for a 1 story, 100 x 800 ft. and a 5 story, 80 x 600 ft. factories, to be erected on Morris St.

Mich., Detroit—The Detroit Seamless Steel Tube Co., 841 West Jefferson Ave., has awarded the contract for two 1 story, 90 x 550 ft. factories and a 70 x 100 ft. heating plant, to be erected on Wyoming and Warren Ave. Estimated cost, $1,700,000. Noted May 29.

Mich., Detroit—The Fisher Body Co., Oakland and Piquette Ave., is having plans prepared by L. Kamper, Arch., Book Bldg., for a 6 story, 165 x 338 ft. finishing plant, to be erected on Theodore and Riopelle St.

Mich., Detroit—The Packard Motor Car Co., West Grand Blvd., will build a 1 story, 241 x 446 ft. and a 3 story, 80 x 225 ft. addition to its plant, on Bellevue and Concord Ave.

Mich., Mt. Pleasant — The Transport Truck Co. has awarded the contract for a 1 story, 160 x 300 ft. assembly plant. Estimated cost, $175,000. Noted May 22.

Ohio, Cleveland—The Bricklayers Association, 2416 East 9th St., has awarded the contract for a 4 story, 40 x 61 ft. garage and dance hall, to be erected at 2101 East 21st St. Estimated cost, $100,000. Noted May 15.

Ohio, Cleveland—The Chester Realty Co., Williamson Bldg., has acquired a site on East 65th St. and Carnegie Ave. and plans to build a 2 story, 55 x 120 ft. garage.

Ohio, Cleveland—The Cleveland Electro Metals Co., 421 Guardian Bldg., is having plans prepared for a 2 story, 40 x 50 ft. addition to its plant, to be erected at 2391 West 38th St. Estimated cost, $6000.

Ohio, Cleveland—The Cleveland Metal Products Co., 1141 Ivanhoe Rd., plans to build a 3 story, 72 x 266 ft. machine shop, a 3 story, 60 x 90 ft. assembling plant and a 1 story, 120 x 300 ft. foundry. Estimated cost, $75,000, $120,000 and $75,000, respectively.

Ohio, Cleveland—The Crucible Steel Castings Co., Canal Rd. and Champlain Ave., has purchased a site on Almira Ave. and Denis St., and plans to build a 2 story, 125 x 300 ft. factory. Estimated cost, $100,000.

Ohio, Cleveland—The Foster Bolt and Nut Machinery Co., 3556 East 72nd St., has awarded the contract for the erection of a 2 story, 77 x 123 ft. factory. Estimated cost, $40,000. Noted July 3.

Ohio, Cleveland—The Gabriel Manufacturing Co., 1407 East 40th St., manufac-